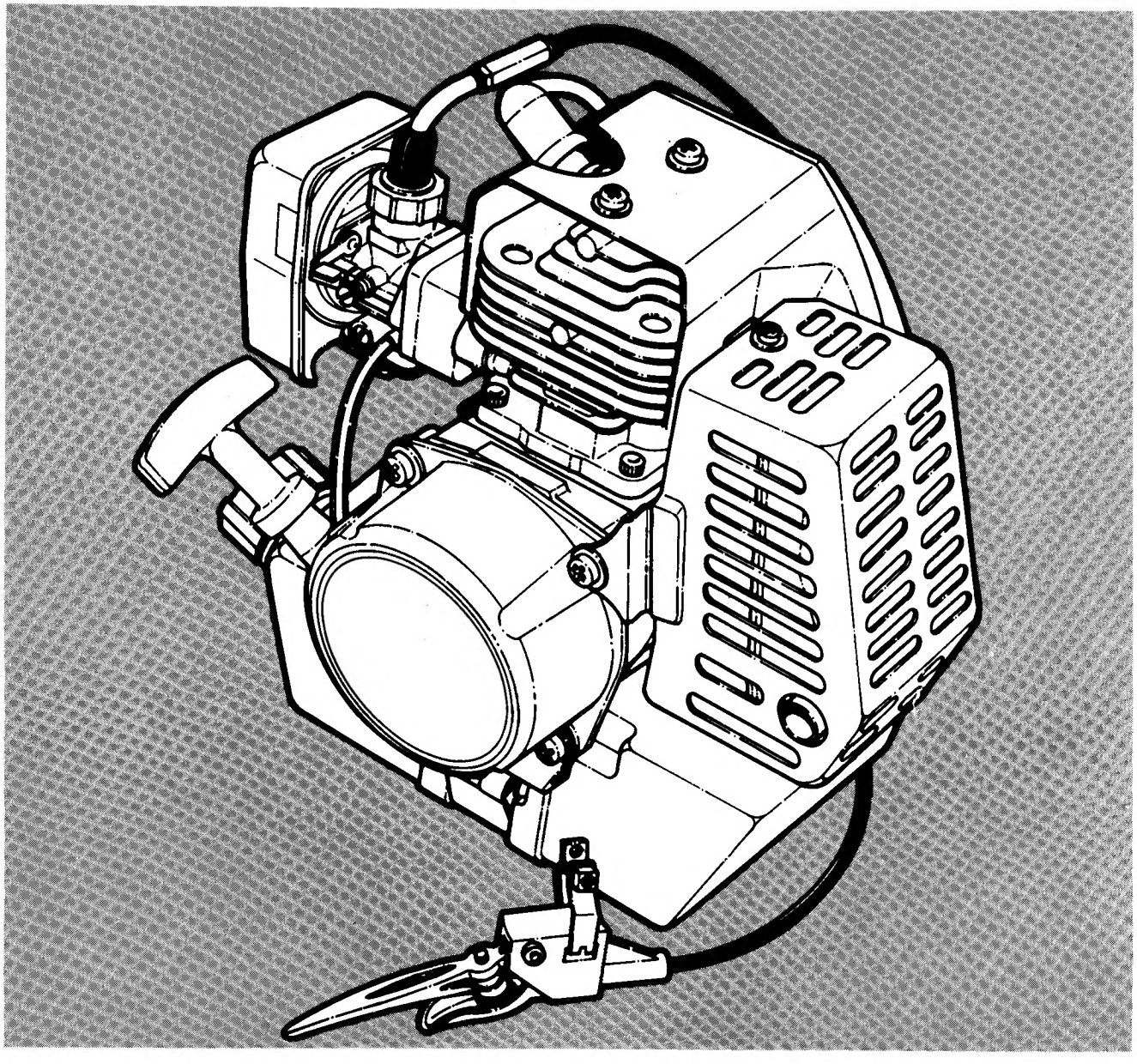
Service Manual for

SNAPPER®



Model 410 Series
TRIMMER ENGINES

SNAPPER POWER EQUIPMENT
McDonough,GA•30253

A FUQUA INDUSTRIES Company

MANUAL No. 07215 (11/85)

SNAPPER®

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SECTION I - FAMILIARIZATION

1.1 This catalog was prepared to expedite service repairs on the SNAPPER Model 410 Trimmer Engine. At the time of writing, the data contained herein was completely up-to-date. However, due to SNAPPER'S continued improvement in design requirements, it is possible that the appearance of component parts may vary slightly from those of the actual engine being repaired. This merely indicates that the engine has been improved to better fulfill its intended requirements.

1.2 NOMENCLATURE

The nomenclature drawings below(Figure 1.1) show the essential parts of the SNAPPER Model 410 Trimmer Engine. It is recommended that all mechanics and other repair personnel become throughly familiar with the controls, components and operation of this engine before attempting any repairs.

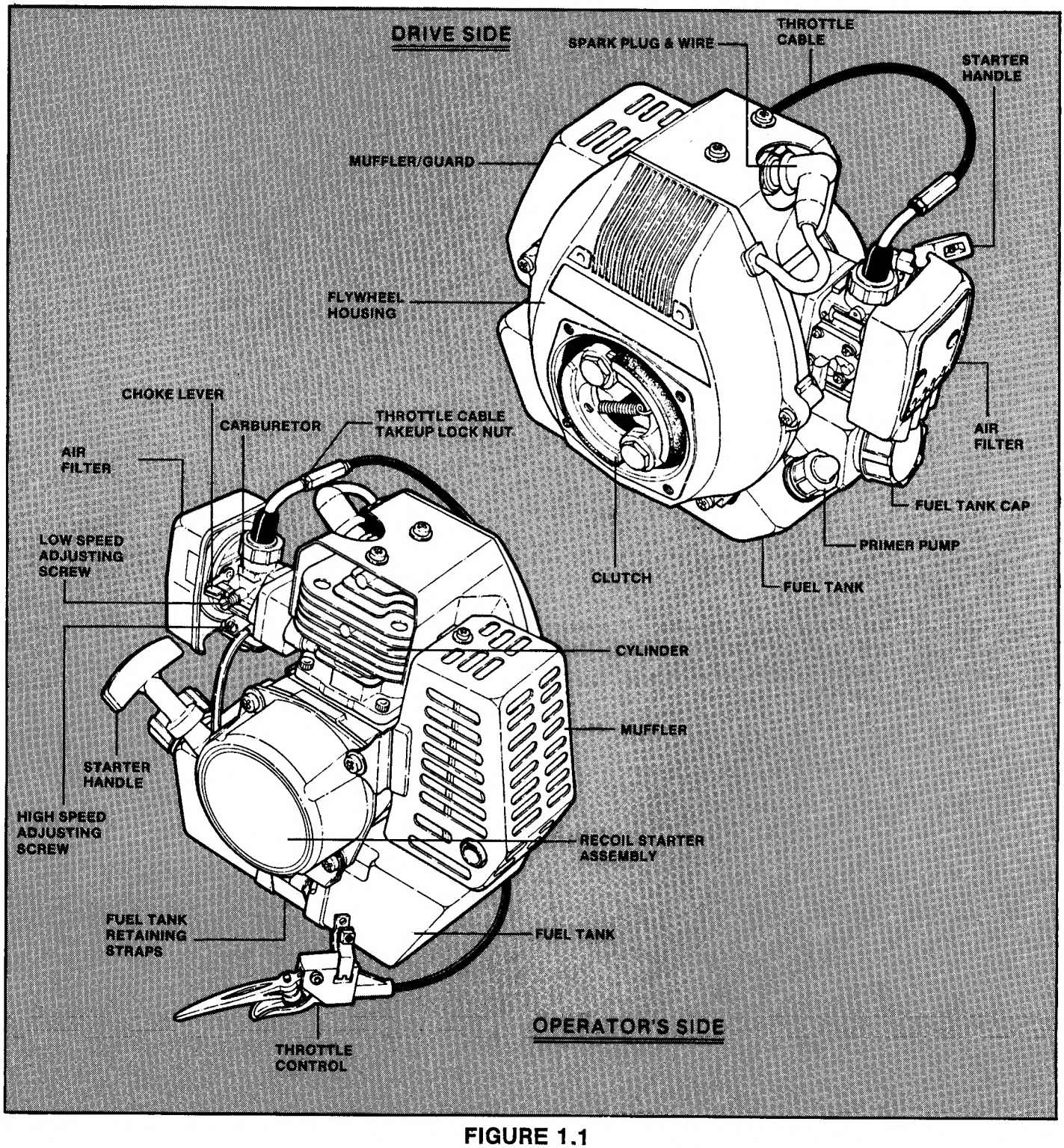


FIGURE 1.1

1.3 SPECIFICATIONS

DESCRIPTION	Model 410-D (Diaphragm Type)
Type - Mitsubishi T-200 P-D	Forced Air-Cooled, 2 Cycle Engine
Bore/Stroke	39mm/34mm 1.54/1.34
Displacement	40.6cc/2.48 cu. in.
Compression Ratio	8:5
Fuel Mixture	Gasoline/2 Cycle Oil - 32:1
Continuous Rated Output (HP/RPM)	1.4/6000
Maximum Output (HP/RPM)	2.0
Maximum Torque (kg m/RPM)	0.24/5000
Dry Weight	3.5 kg/7.7 lbs.
Rotation Direction	Counterclockwise
Method of Starting	Recoil Starter
Carburetor	Diaphragm
Air Filter	Semi-Wet Polyurethane Foam
Method of Ignition	Magneto (Points or MTI)
Spark Plug	NGK BM 6 A/AC CS45 SNAPPER #68025
Fuel Tank Capacity	1 liter/1.057 qt.
Method of Fuel Feed	Diaphragm Pump
Clutch (Inside Drum Diameter)	78mm/76mm 3.07"/3.00"
Clutch IN Revolution (RPM)	3100 - 3500
Idle Set Speed (RPM)	2300 - 2700

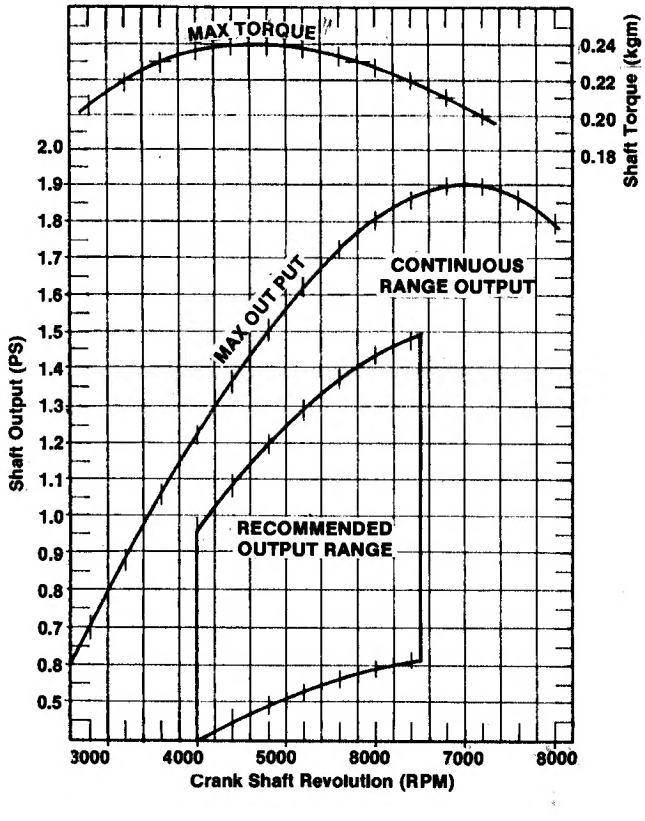
1.4 PERFORMANCE RATING CHART

A. Maximum Output-
On a completely run in (broken in) engine, maximum output means the amount of power produced when the carburetor throttle valve is fully opened.

B. Continuous Rated Output-
That power output which can be continuously maintained. Also, it is the output level recommended by the manufacturer for maximum performance efficiency and engine durability.

C. Maximum Torque-
That amount of torque produced at the point of maximum output.

D. Recommended Output Range-
That output range in which the engine can be used with stability. It is also the best working range for maximum economy and durability of the engine.



2.1 CRANKCASE

The crankcase is diecast aluminum and has an internal compression ratio of 1.3 to 1.5. Complete airtightness of the crankcase must be maintained in order to properly compress the airfuel mixture from the intake port before it is fed to the combustion chamber. Locating pins are cast into the flywheel housing for proper mating with the drive side of the crankcase. Because the flywheel housing and crankcase are machined as a unit, the whole assembly (all three parts) must be replaced should any one part need replacing. See Figure 2.1.

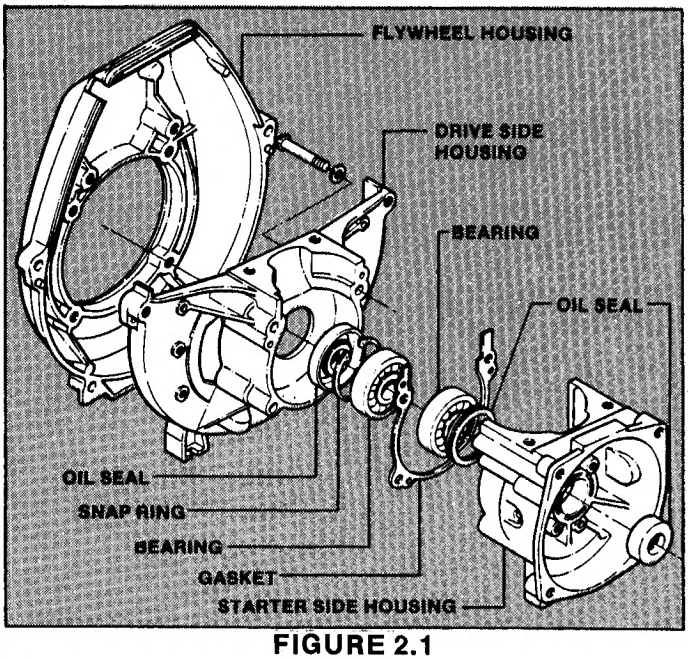


FIGURE 2.1

2.2 CRANKSHAFT AND CONNECTING ROD

The crankshaft is made of forged steel with carburized and ground-finished crankpin and journals for increased wear resistance. The connecting rod is an integral part of the crankshaft assembly and cannot be removed. Should either the crankshaft or rod require replacing then the entire crankshaft assembly must be replaced. Replacement items for the crankshaft assembly are: wrist-pin needle bearing, main bearings, key, washers and nuts. See Figure 2.2.

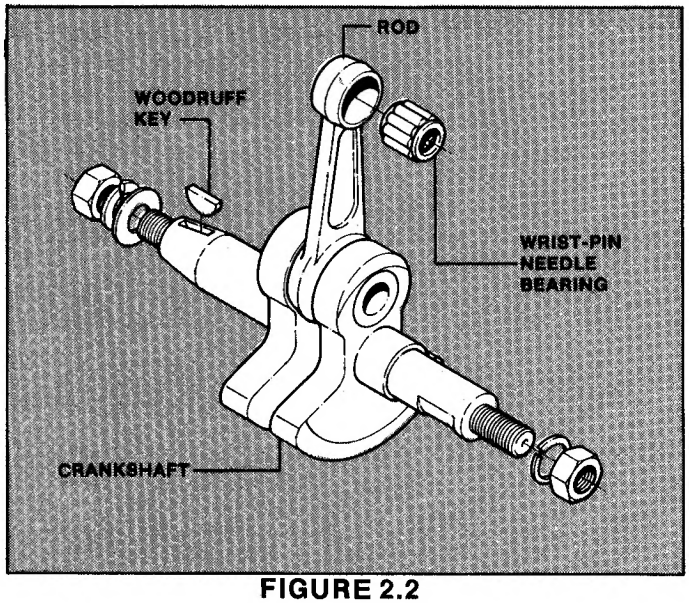


FIGURE 2.2

A. Measuring Crankshaft Runout

With crankshaft supported at points "A" and "A" in a suitable fixture, the total allowable crankshaft runout at points "B" and "B" is shown in the chart below. See Figure 2.3 & 2.4.

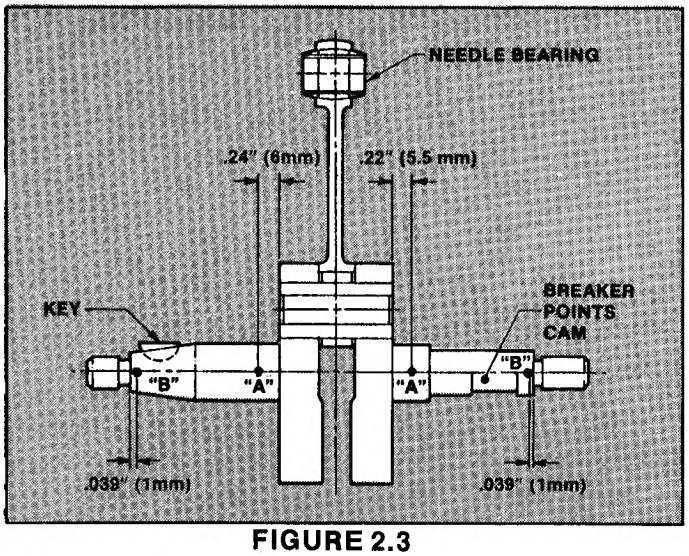


FIGURE 2.3

CRANKSHAFT RUNOUT CHART		
Crankshaft Runout	Point	Dimension
Standard Dimension	B	.0019" Max.
	B	.0019" Max.
Allowable Limit	B	.0023"
	B	.0023"

Replace the crankshaft assembly if runout exceeds the allowable limit.

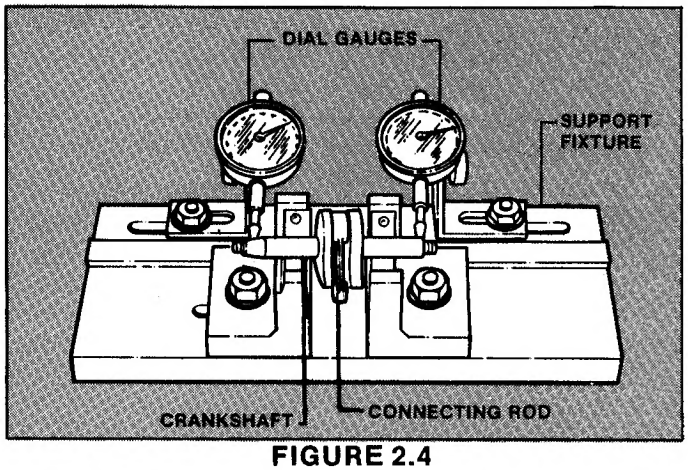


FIGURE 2.4

B. Measuring Clearance Between Rod and Crankshaft.

With connecting rod pushed against crankshaft counterweight, insert feeler gauge into clearance side and take measurement. Take this same measurement at four places (90 degrees apart) around the rod base and if clearance exceeds the allowable limit at any point, replace crankshaft assembly. See Figure 2.5 and chart.

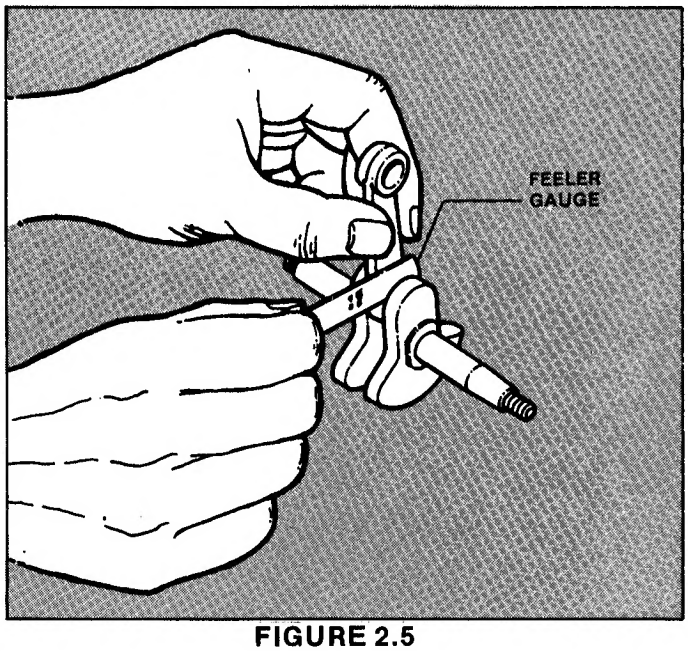


FIGURE 2.5

ROD CLEARANCE CHART	
Rod Clearance	Dimension
Standard Dimension	006 - .014
Allowable Limit	.022

C. Measuring Clearance Between Connecting Rod and Crank Throw.

Mount crankshaft in a fixture similar to Figure 2.6. Place a mounted dial gauge over the rod end as shown and move the rod up and down for dial reading. If reading exceeds allowable limit shown in chart, replace crankshaft assembly.

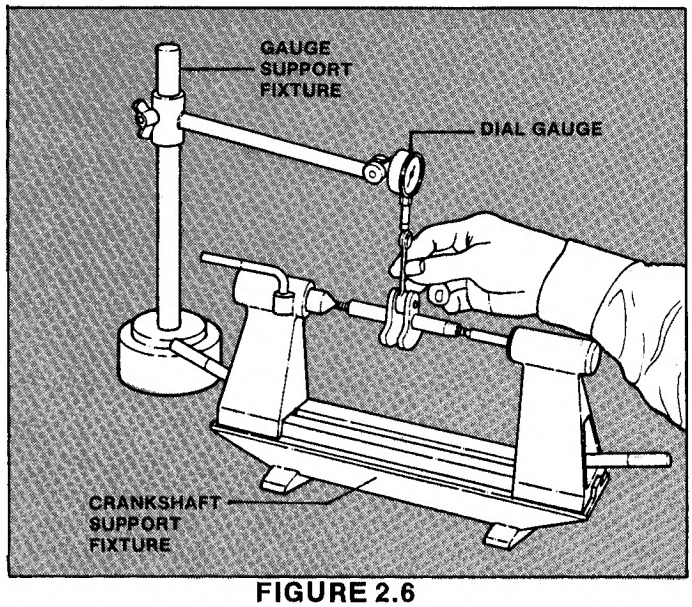


FIGURE 2.6

CRANK THROW & ROD CLEARANCE CHART	
Rod Clearance	Dimension
Standard Dimension	0 - 0.001
Allowable Limit	.002"

D. Measuring Clearance Between Connecting Rod Needle Bearing and Wrist Pin.

1. Using cylinder gauge, measure inside diameter of connecting rod needle bearing as shown in Figure 2.7.

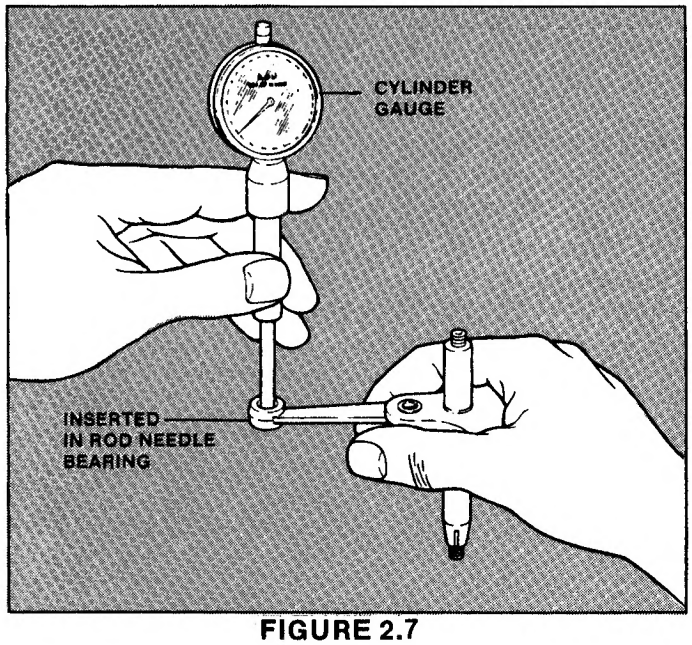


FIGURE 2.7

2. Measure outside diameter of wrist pin with a micrometer as shown in Figure 2.8.

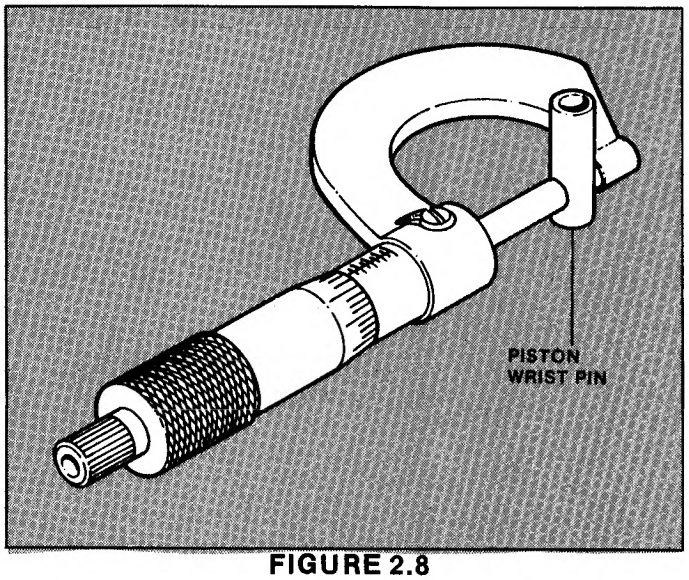


FIGURE 2.8

3. If the difference between measurements(1) and (2) exceed the allowable limit shown in chart, replace the wrist pin and needle bearing. And, if required, replace the piston and piston rings as a set.

ROD BEARING & WRIST PIN CLEARANCE CHART	
Bearing/Pin Clearance	Dimension
Standard Dimension	0.00004" - 0.0009"
Allowable Limit	.0019

E. Measuring Clearance Between Crankshaft and Main Bearings.

1. Measure the outside diameter of each crankshaft journal with a micrometer. See Figure 2.9.

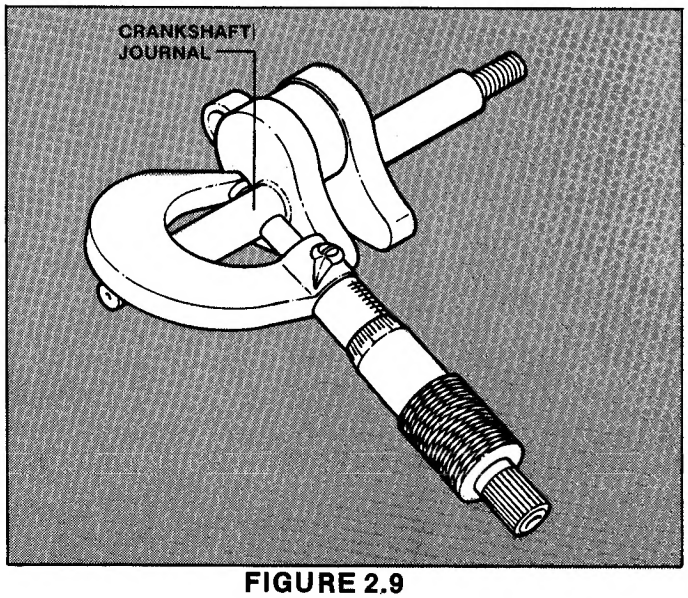


FIGURE 2.9

2. Replace main bearings and crankshaft assembly if measurements exceed allowable limit shown in chart.

MAIN BEARING & CRANKSHAFT CLEARANCE CHART	
Bearing/Crankshaft Clearance	Dimension
Crankshaft Journal Dimension	.591 - 0.0002 - 0.0005
Standard Dimension	0.0001 - 0.0005
Allowable Limit	0.0019

2.3 CYLINDER

The combination cylinder/cylinder head is made from a single piece of diecast aluminum for better heat dissipation and reduced weight.

A. The cylinder casting contains an intake port, exhaust port and two scavenging ports. The inside surface is porous chrome plated for improved durability. See Figure 2.10.

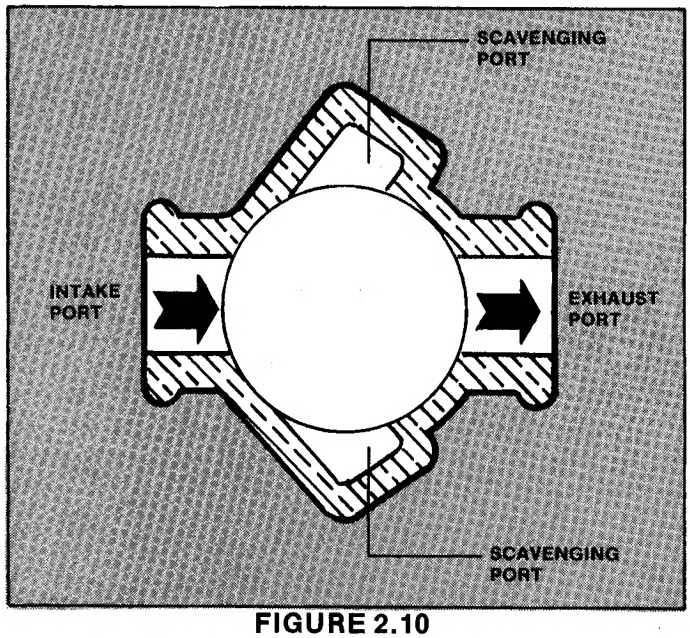


FIGURE 2.10

B. The operative relationship between intake, scavenging and exhaust ports is shown below. Figure 2.11.

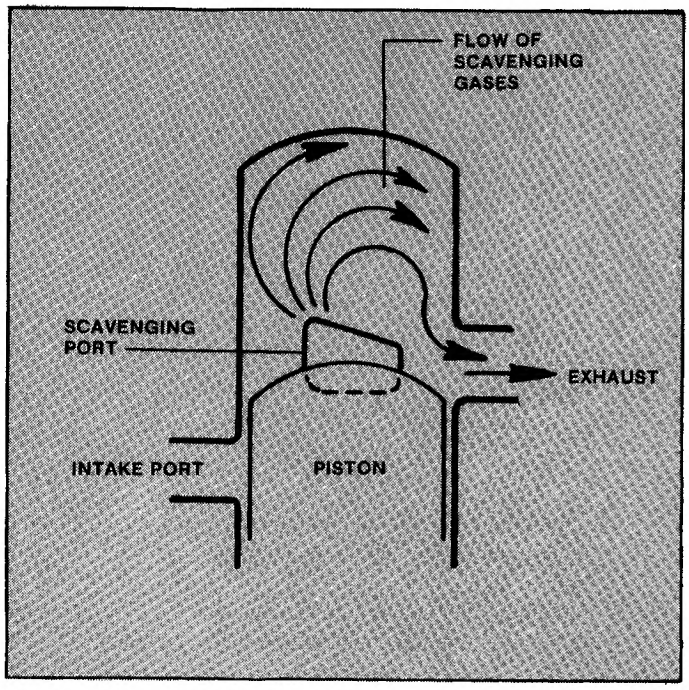


FIGURE 2.11

C. The cylinders carburetor mounting surface (intake) is provided with an air hole (pulse hole) which transmits the pressure variation in the crankcase to the diaphragm pump in the carburetor. This pulse hole is used **ONLY** for engines with a diaphragm valve type carburetor(D Type). It is **NOT** to be used with a float valve type carburetor. See Figure 2.12.

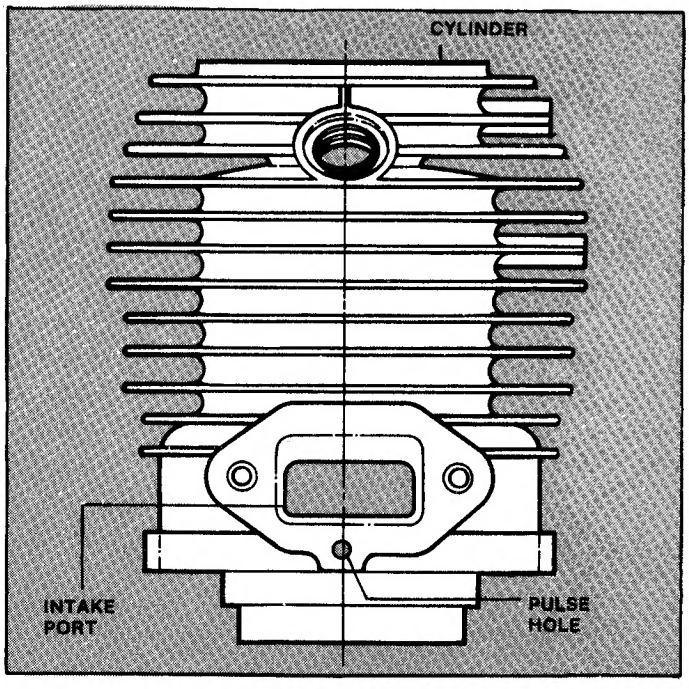


FIGURE 2.12

D. Measure the cylinder bore with a cylinder gauge as shown in Figure 2.13.

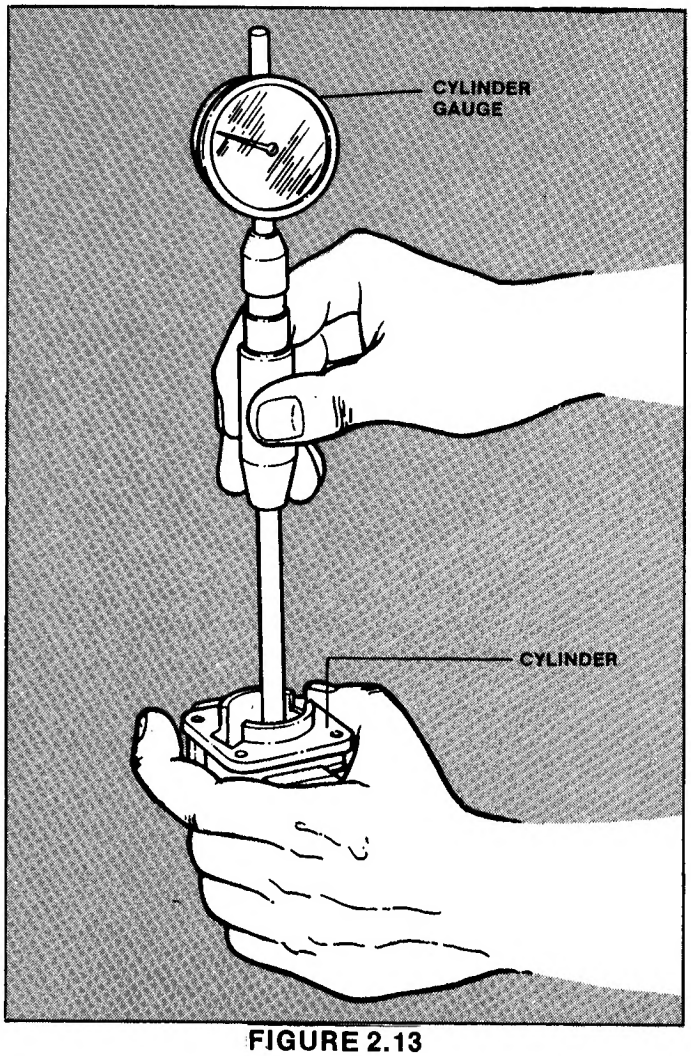


FIGURE 2.13

CYLINDER BORE CHART	
Cylinder Bore	Dimension
Standard Dimension	1.5354 -0.0008 0
Allowable Limit	Until Plating Deteriorates

E. Using a screwdriver or knife, clean carbon deposits from combustion chamber and exhaust port. Use care not to damage or scratch chrome plated cylinder wall.

2.4 PISTON AND PISTON RINGS

The piston is made from a special aluminum alloy to reduce weight and bearing load during operation. Its crown is semi-spherical in shape to facilitate flow of exhaust gases and scavenging air (as in all 2-cycle engines, the scavenging ports open up before the end of the exhaust stroke to allow the pressurized air-fuel mixture from the crankcase to feed into the combustion chamber. This also assists in dispelling any remaining exhaust gases). See Figure 2.14.

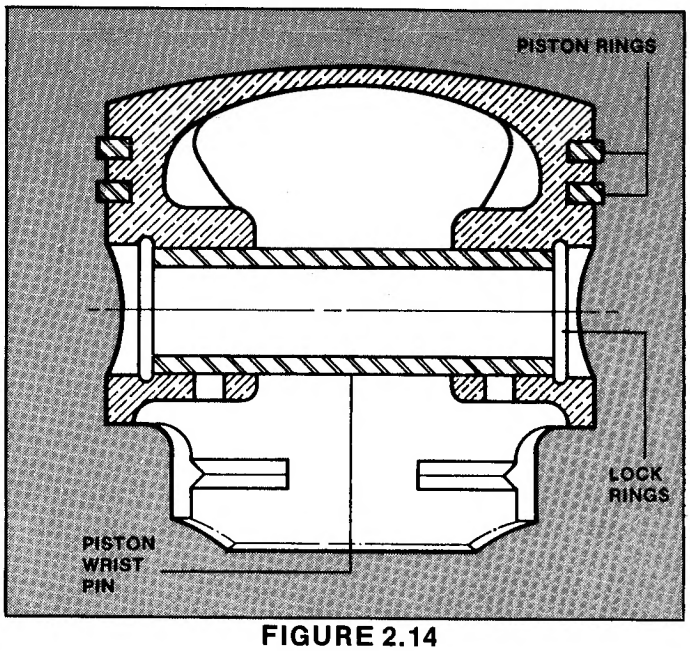


FIGURE 2.14

Piston rings are made from a special cast iron and then surface treated by parkerization for improved wear resistance. They are kept in location on the piston by roll pins which prevent their open ends from being caught in the cylinder ports. The piston wrist pin is kept in place by a lock ring on each side. See Figure 2.15.

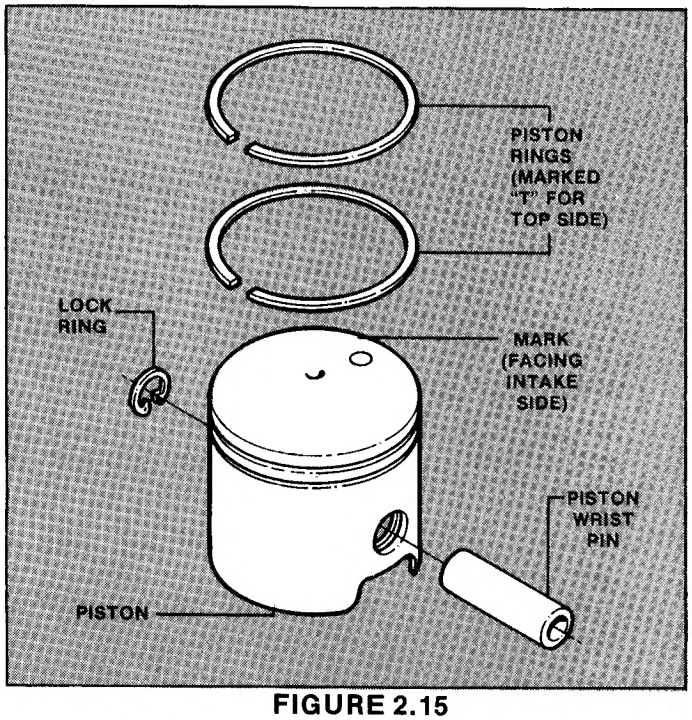


FIGURE 2.15

A. Clearance Between Piston and Cylinder.

1. Measure the maximum diameter of piston with a micrometer. See Figure 2.16.

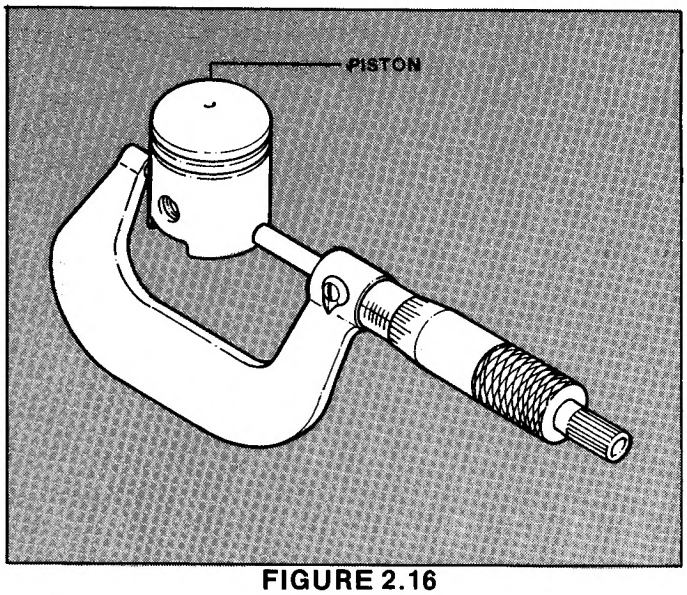


FIGURE 2.16

2. Calculate the difference between piston diameter and cylinder bore.

3. Replace piston assembly if clearance difference exceeds allowable limit.

PISTON CLEARANCE CHART	
PISTON	DIMENSION
Outside Diameter	1.5354 - 0.0014 0. - 0.0019
Standard Dimension	0.0014 - 0.0028
Allowable Limit	0.0039

B. Clearance Between Piston and Wrist Pin.

1. Using a cylinder gauge, measure the inside diameter of the piston wrist pin hole. See Figure 2.17.

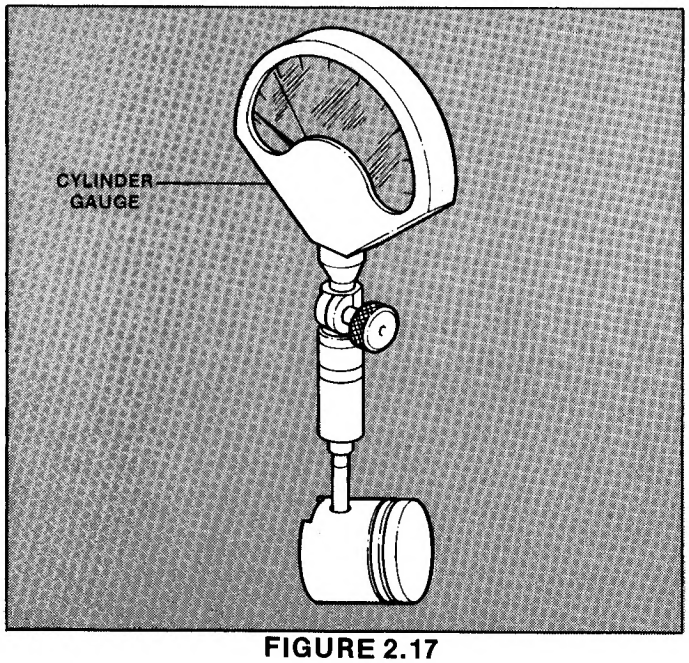


FIGURE 2.17

2. Measure the outside diameter of the wrist pin with a mircometer. See Figure 2.18.

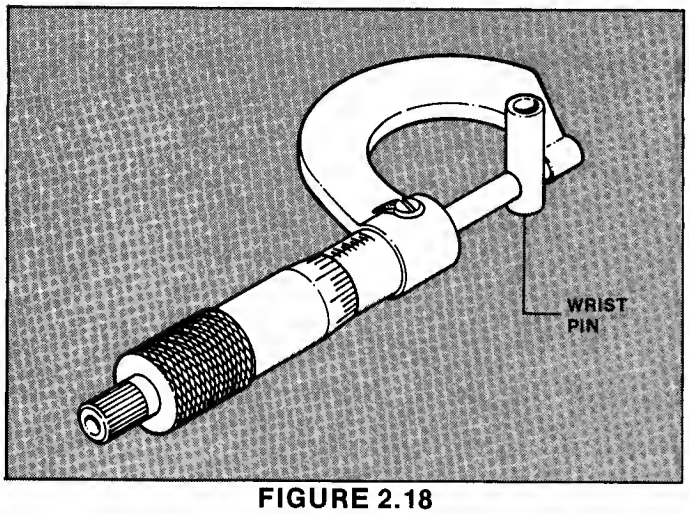


FIGURE 2.18

3. If the clearance between piston and wrist pin exceeds allowable limit, replace both as a unit.

PISTON/WRIST PIN CLEARANCE CHART	
Piston/Wrist Pin Clearance	Dimension
Standard Dimension	0.0004 - 0.0003
Allowable Limit	0.0019

C. Clearance Between Open Ends of Piston Rings.

1. Using a piston for seating purposes, install a piston ring inside cylinder as shown in Figure 2.19.

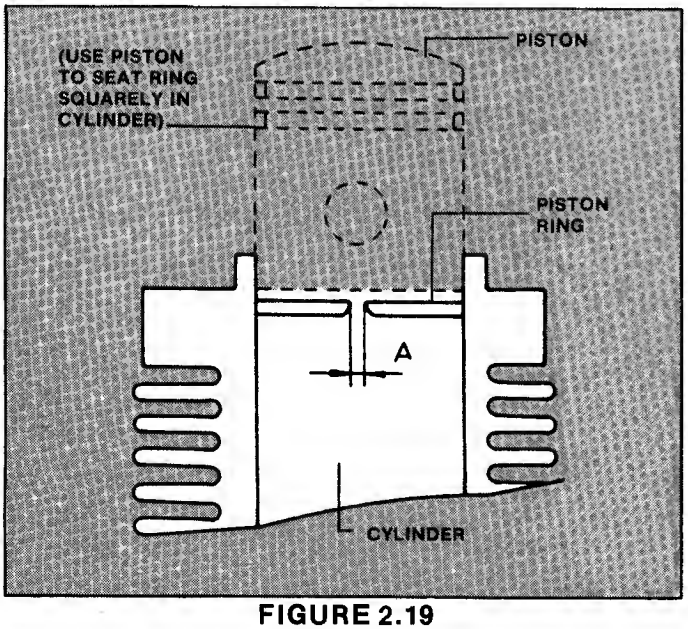


FIGURE 2.19

2. Measure the clearance between open ends (dimension A) of ring with feeler gauge.

3. Replace rings if clearance exceeds allowable limit.

PISTON RING ENDS CLEARANCE CHART	
Piston Ring End Clearance	Dimension .0039
Standard Dimension	0 - 0.0118
Allowable Limit	0.0276

D. Clearance Between Piston Ring and Ring Groove.

1. Measure clearances between piston rings and grooves with feeler gauge. See Figure 2.20.

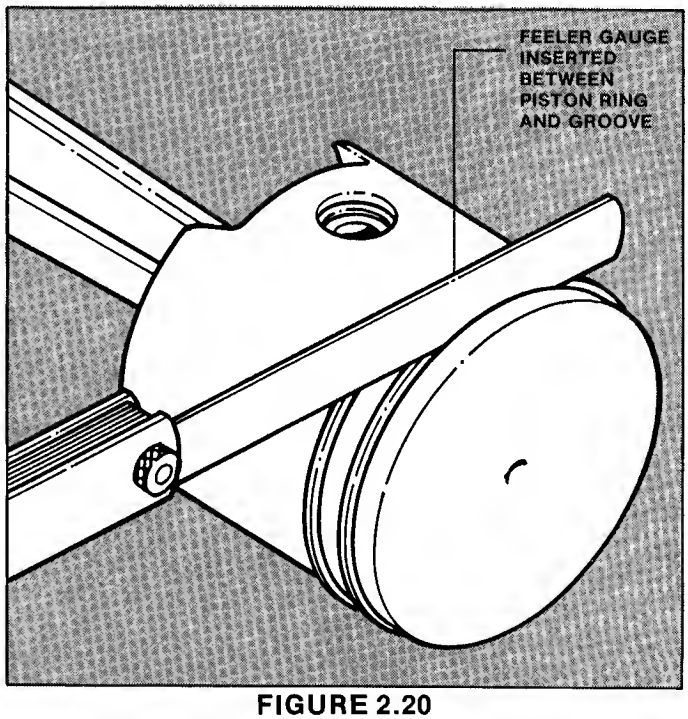


FIGURE 2.20

2. Replace piston and rings if clearance exceeds allowable limit.

RING AND GROOVE CLEARANCE CHART	
Ring and Groove Clearance	Dimension
Standard Dimension	0.0019 - 0.0035
Allowable Limit	0.0059

E. Cleaning Piston

Remove any carbon deposited on head and ring grooves. Finish with No. 400 fine sandpaper.

2.5 CENTRIFUGAL CLUTCH

The centrifugal clutch consists of two weighted shoes held together by a spring of predetermined tension. As the engine **RPM**'s begin to exceed holding tension of the spring, the shoes rotate outward due to centrifugal force and make contact with the clutch drum on the work side of the machine. See Figure 2.21.

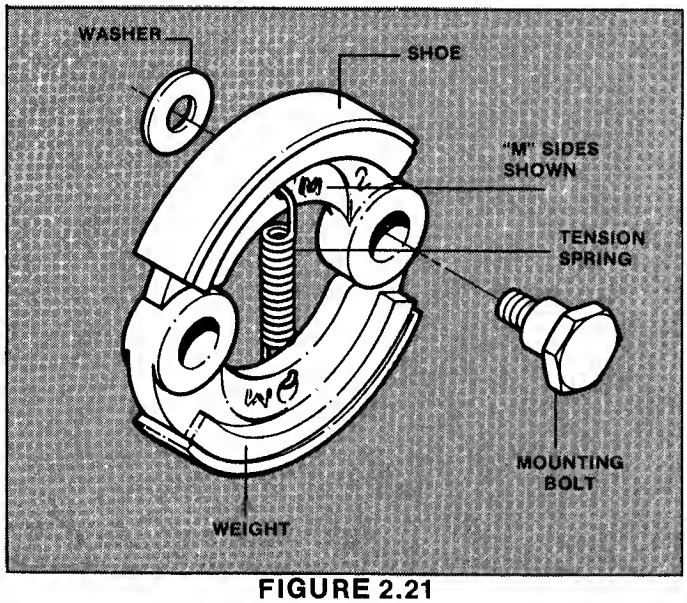


FIGURE 2.21

A. Clutch Drum Diameter and Clutch **IN** Revolution.
(Clutch **IN** revolution is defined as that engine speed at which the clutch begins to transmit rotary power to the clutch drum with a loading of 0.02 IN. LBS.).

CLUTCH CHART	
Clutch Drum	Dimension/RPM
Clutch Drum Inside Diameter	2.992 or.3.070 2.9-3.1''
Clutch **IN** Standard Revolution	3350 RPM
Weight Tightening Torque	1.8-2.2lbs. inch

NOTE: Take care not to get any thread-locking compound on any clutch parts or fasteners.

B. The clutch shoes are stamped "P" and "M" on either side. Make sure that the letters are matched on whichever side is being used.

C. If clutch has been operated at overload conditions for a long period of time, then glazing of the shoes will probably occur. Roughing of the shoes with sandpaper will remedy this situation.

D. Clutch shoes should last indefinitely if properly cared for.

2.6 RECOIL STARTER

The recoil starter is a separate subassembly of engine. When the starter rope which is wound on the reel by the tension of the spiral spring is pulled, the ratchet linked with the reel opens, causing the starter pulley to turn. See Figure 2.22.

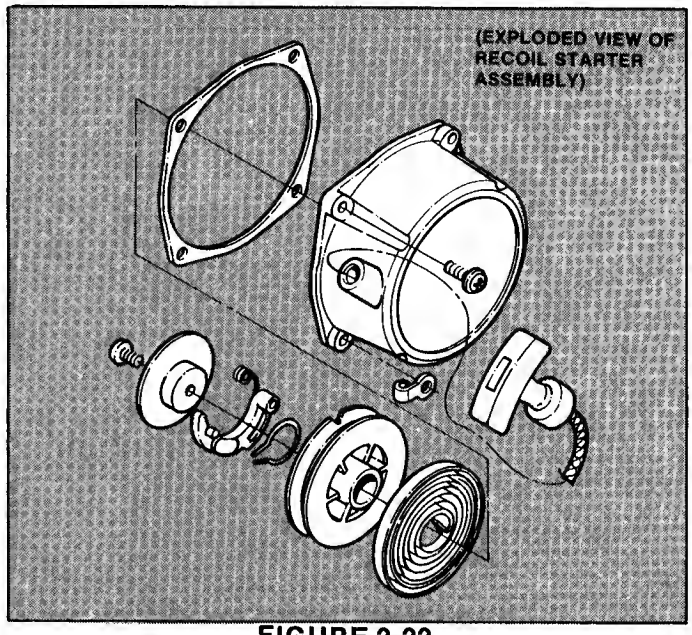


FIGURE 2.22

2.7 THROTTLE CABLE

At the operators end, the throttle cable has an adjustable control lever and **"FULLY OPEN"** lock button by which the operator controls engine speed. As use of the engine increases, the throttle cable will stretch and become slack and the carburetor throttle valve opening (about 30% at time of starting) will change in relatior to control setting. Since this seriously affects engine starting efficiency, the throttle cable should be periodically checked and adjusted to proper tension with the adjusting and lock nuts. See Figure 2.23.

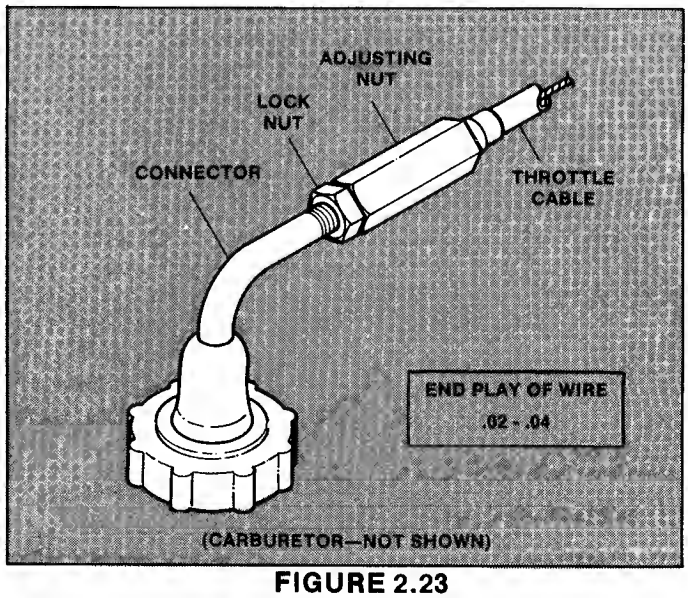


FIGURE 2.23

2.8 FUEL SYSTEM

The SNAPPER Model 410 Trimmer Engine is provided with a diaphragm - type carburetor.

Model 410 Fuel System Components: Fuel tank; tank cap; primer pump; fuel hose; fuel filter and weight. See Figure 2.24.

A. Fuel Tank

The fuel tank is made from a heat resistant plastic which is impervious to oil and gasoline. Capacity is 1.0 litre (34 oz.).

B. Fuel Tank Cap

An umbrella valve type fuel tank cap is used for the Model 410-D. See Figure 2.25.

C. Storing of Machine Using Umbrella Valve Fuel Cap.

When storing machine, position it to where tne inside packing of the tank cap will not be immersed in fuel. This will help prevent fuel leaks due to internal pressure of tank when the fuel level reaches the air hole in the packing.

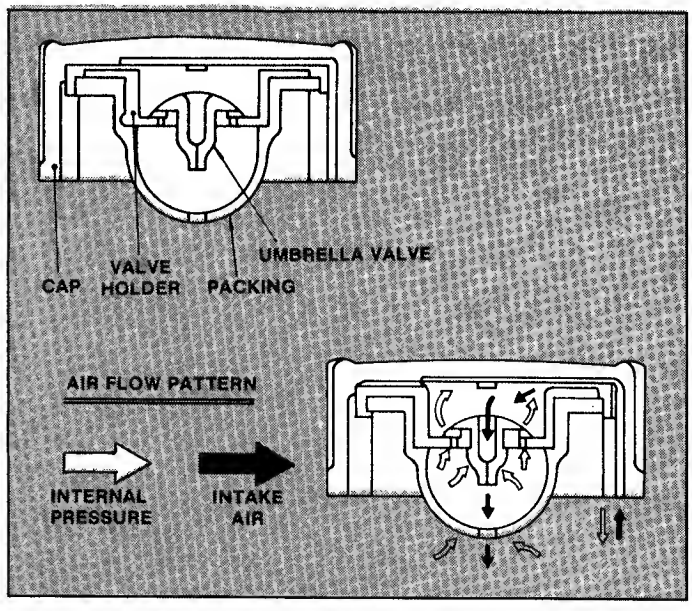


FIGURE 2.25

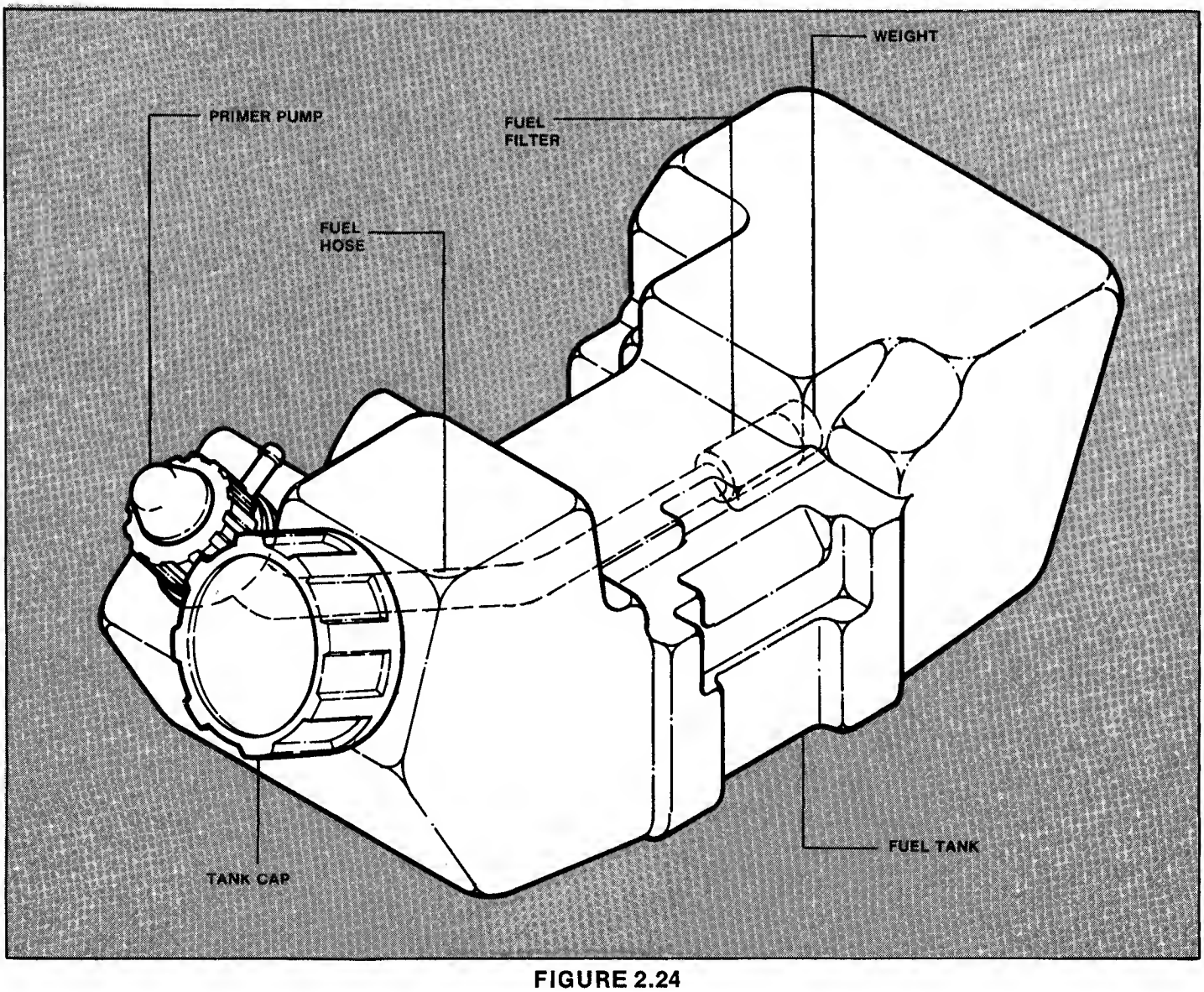


FIGURE 2.24

D. Primer Pump

The manually operated primer pump is used to feed fuel to the carburetor when starting the engine. Because the internal parts of the primer pump are very small, care should be taken not to lose or incorrectly reassemble them when repairs are being made. See Figure 2.26

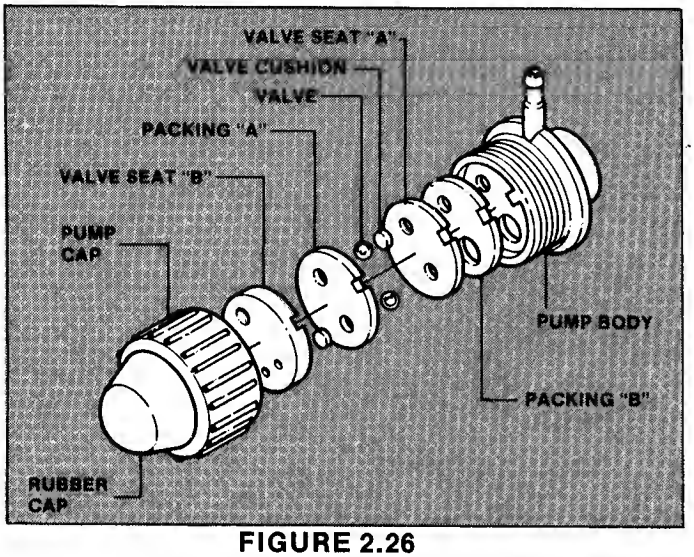


FIGURE 2.26

2.9 AIR FILTER

The Model 410 engine uses an air filter made of plastic with a polyurethane foam filter element which requires cleaning every 25 hours (or less) of operation. To clean the element, wash thoroughly in solvent or detergent, squeeze and immerse in engine oil. Squeeze again, ejecting most of the oil, and then remount in case. See Figure 2.27.

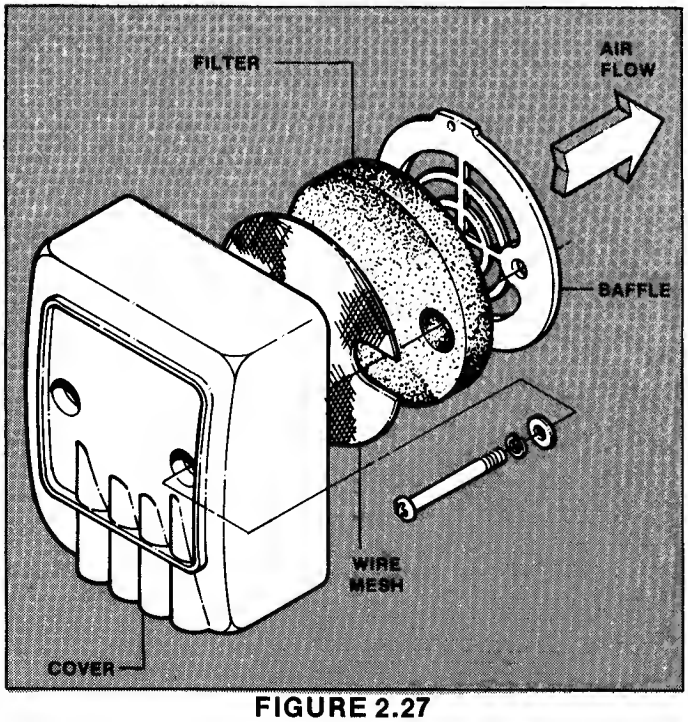


FIGURE 2.27

2.10 MUFFLER

The muffler is an expendable item and cannot be repaired. It should, however, have any carbon buildup removed by using a screwdriver or heavy wire brush.

2.11 FLYWHEEL/MAGNETO-INSPECTION & ADJUSTMENTS

The flywheel/magneto contains an ignition system which includes the coil, contact breaker and flywheel. The contact breaker can be one of two types - **MTI** unit or points. Instructions for inspection, adjustments and servicing of parts is contained in the following text.

A. Flywheel

Magnetic steel for power generation is cast into the flywheel. Its fins serve as the cooling mechanism for the engine and it also serves as the clutch mount. Since the flywheel serves various functions, care should be taken not to drop it on the floor during repairs. See Figure 2.28.

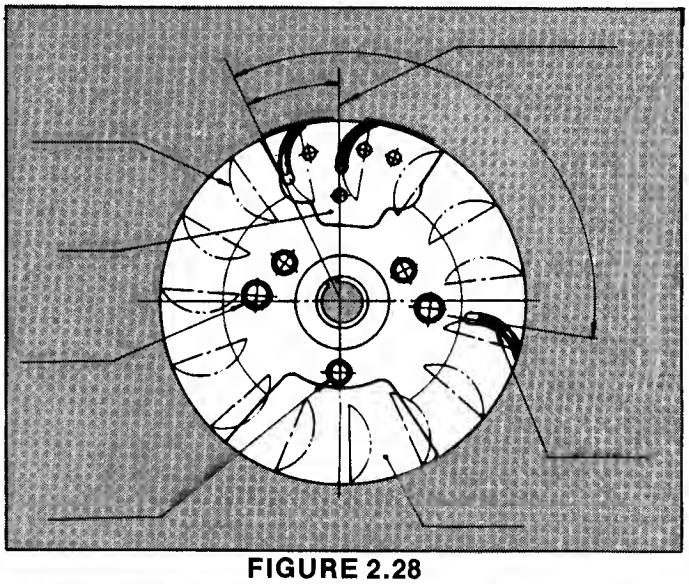


FIGURE 2.28

		MTI	BREAKER POINTS
*Mark Each Degree	*1	29° ±½°	33° ±½°
	*2	124°	128°
Power Take-Off Hole	#2 Boss	M 8 x 2	
	#3 Boss	M6 x 3	

1. **Timing Mark**

On the flywheel designed for breaker points, there is a red-colored "–" timing mark on one of the cooling fins. Its match mark for firing is the arrow and "P" mark on the drive side of the crankcase. See Figure 2.29.

NOTE: If timing mark is damaged during flywheel removal, replace flywheel.

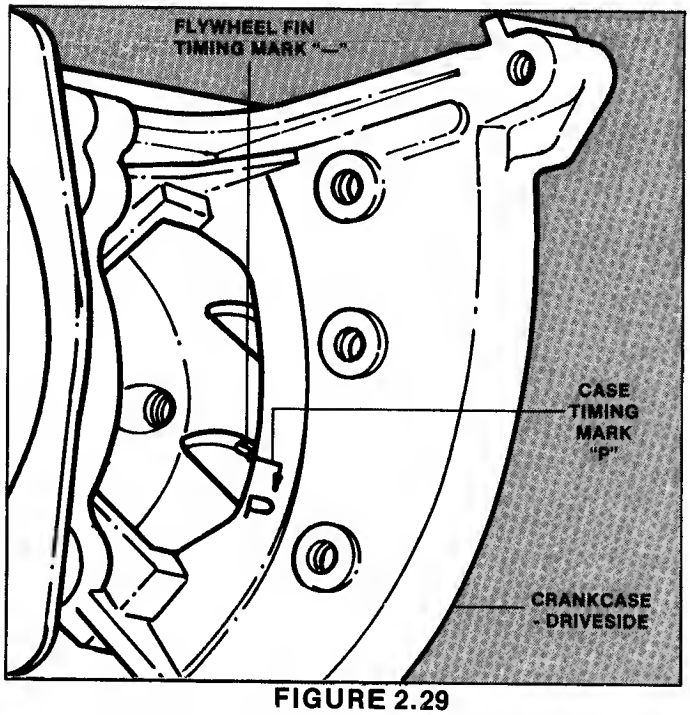


FIGURE 2.29

2. if flywheel becomes deformed or unbalanced it should be replaced. Otherwise, the main bearings will be quickly worn out.

3. When reinstalling flywheel, torque to 1.0-3kg.m./2.2-6.6 lbs. inch.

B. IGNITION COIL

The Ignition coil is waterproof and has a primary wire (low voltage) and secondary wire wound in the Interior. The primary wire connects to the breaker points or **MTI** unit and stop switch. The secondary wire connects to the spark plug. See figure 2.30.

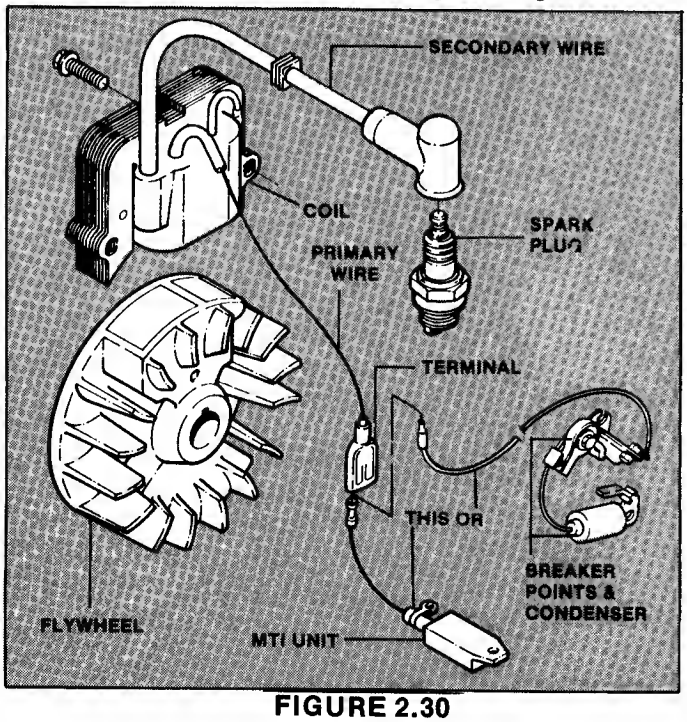


FIGURE 2.30

1. **Checking Coil Performance**
Using a coil tester, measure the sparking performance of the coil. Replace coil if spark length is less than specified value.

COIL TESTING CHART	
Ignition Type	**Spark Length/RPM**
Points	0.27" / 500 RPM
	0.31" / 1,000 RPM
MTI	0.26" / 550 RPM
	0.33" / 1,000 RPM

2. **Adjusting Ignition Coil Air Gap**
The air gap (clearance) between the ignition coil and outer circumference of the flywheel is a very important factor which affects engine startability. Therefore, air gap adjustments should be made with care.

(a) Loosen ignition coil mounting screws.
(b) Use a brass, plastic, or otherwise non-magnetic feeler gauge and insert gauge between flywheel and ignition coil.
(c) Adjust coil up or down until the air gap measures .015" - .019". See Figure 2.31.

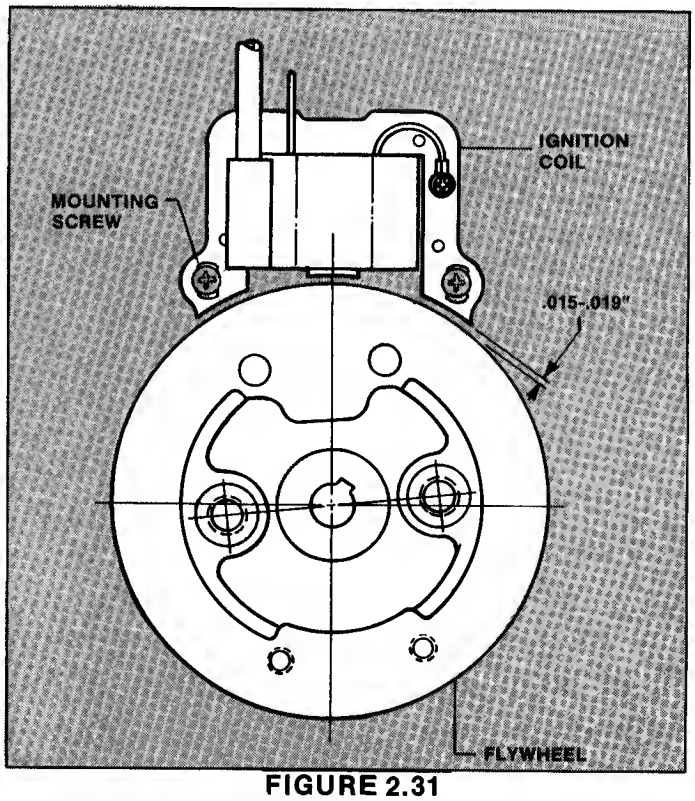


FIGURE 2.31

C. BREAKER POINTS

If engine is equipped with breaker point type ignition, the points should be checked for fouling or corrosion. Clean the contact points with fine grain emery paper and, if

required, use a fine file to grind away any protrusions on the point surfaces. Before reinstalling points, apply a small amount of Molykote GP Paste, or equivalent, to contact arm bearing post. Moisten the felt lubricator with a drop or two of oil. See Figure 2.32.

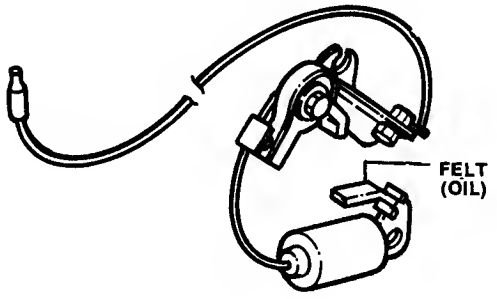


FIGURE 2.32

1. **Breaker Point Location and Deviation**
   Deviation = within 0.007 in all directions.
   Location = within 2/3 of the center of the diameter. See Figure 2.33.

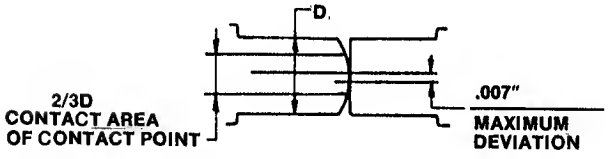


FIGURE 2.33

2. **Adjusting Point Gap**
   Turn crankshaft until crankshaft cam has opened points to widest position. Insert feeler gauge between points and adjust to .013 ∓ .002 by loosening and tightening point mounting screw. See Figure 2.34.

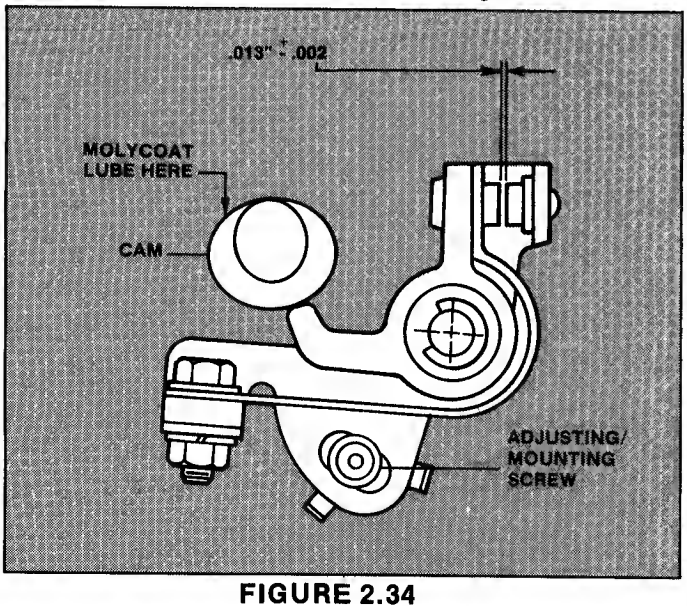


FIGURE 2.34

D. TIMING ADJUSTMENT

Adjust the breaker point mounting plate screw until the point contacts begin to open as the "-" mark on the flywheel fin lines up with the arrow and "P" mark on the drive side of the crankcase. The ignition timing is adjusted to 25 ±3° **BTDC** as a result of these adjustments.

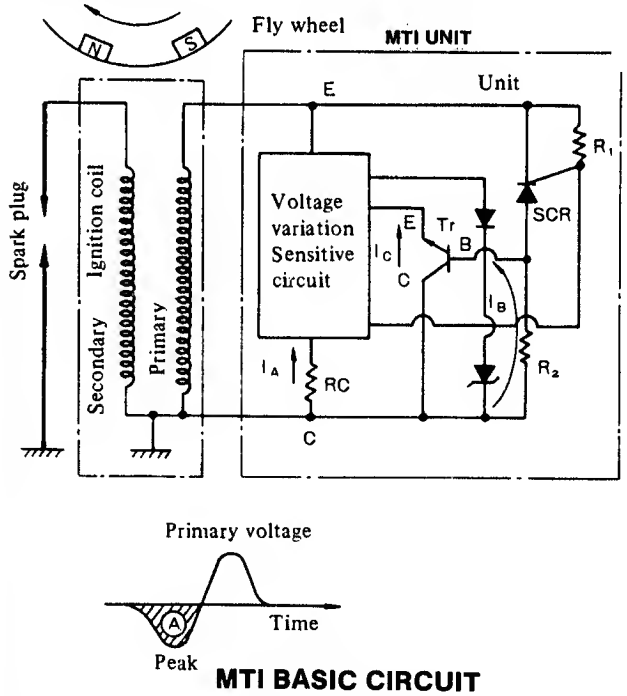
E. CONDENSER

Using a condenser capacity tester, test the condenser for proper insulation resistance capacity. Replace condenser if tested values are less than those shown in chart below.

CONDENSER CAPACITY CHART	
Insulation Resistance Meter with 1,000v capacity	10 Mo
Condenser Capacity	0.22 mf

F. MTI UNIT

The **MTI** Unit is an electronically controlled, contact-free ignition system. Since ignition timing is controlled with an electrical circuit, problems due to fouling, wear and rust, common to a point system, are eliminated. A basic circuit of the **MTI** Unit is shown by Figure 2.35.



MTI BASIC CIRCUIT
FIGURE 2.35

NOTE: The **MTI** Unit, if suspected to be faulty, can be tested with standard semiconductor testing apparatus. If found to be faulty, replace unit as it cannot be repaired.

SECTION III - CARBURETOR - CONSTRUCTION & SERVICE

3.1 OPERATION OF CARBURETOR

The carburetor works on the spray principle. It mixes air and fuel in a suitable ratio to meet engine requirements through all ranges of operation.

A. DIAPHRAGM/PISTON TYPE CARBURETOR

FIGURE 3.1

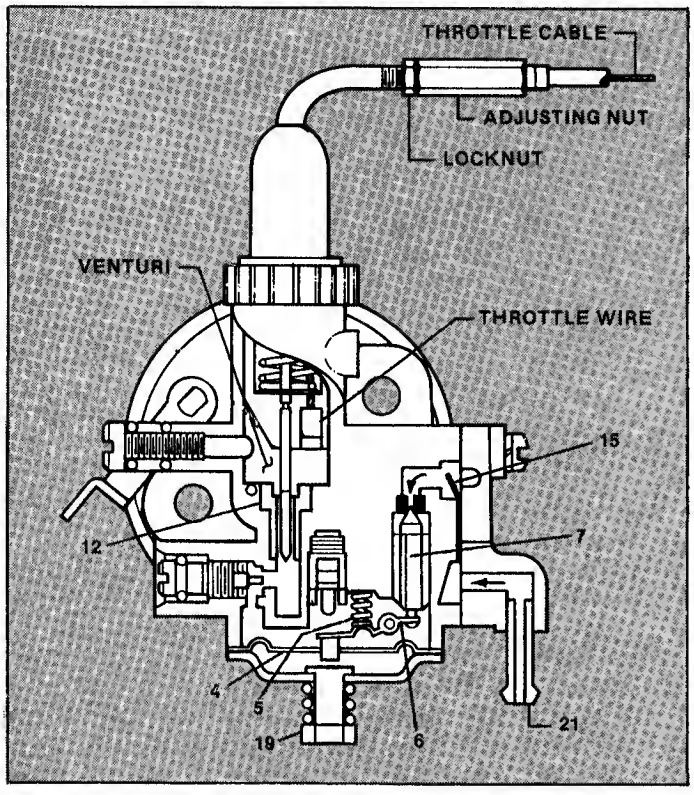


FIGURE 3.1

1. Diaphragm pump (15) is activated by pressure variation in crankcase and pulls fuel through fuel inlet (21). Fuel is then fed under pressure to float valve. (7).

2. Engine intake pressure is applied to main diaphragm (4) by needle jet (12) while atmospheric pressure pushes on the opposite side of the diaphragm. As a result, float arm (6) is pushed, lowering float valve (7) and fuel flows into float chamber.

3. Because of negative pressure In the venturi, fuel in the metering chamber sprays out of needle jet (12) and is pulled Into the engine as an air/fuel mixture.

4. When the engine is stopped, negative pressure in the venturi is reduced to zero and float arm (6) is pushed upward by inlet spring (5) closing float valve (7). Flow of incoming fuel is shut off, preventing overflow. (At time of engine starting, fuel is fed under pressure to metering chamber through diaphragm pump (15) and float valve (7) when tickler button (19) is pushed and primer is operated.)

3.2 CARBURETOR COMPONENTS & ADJUSTMENTS

A. THROTTLE VALVE & NEEDLE JET

The piston-type throttle valve provides easy transition from low to high speeds. Its bottom profile is designed with a large air inlet area and a smaller air outlet area. Because of the venturi effect of this design, the flow of air-fuel mixture is very fast and atomization of fuel occurs rapidly even when the throttle is barely opened. See Figure 3.2.

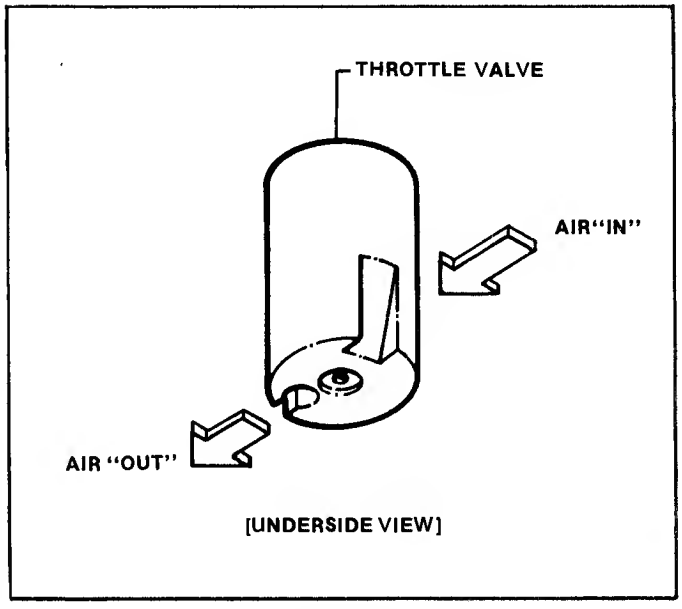


FIGURE 3.2

1. Cut-away (CA) and recessed (R) portion of each throttle valve are match-machined to stabilize the fuel flow during engine idling. See Figure 3.3.

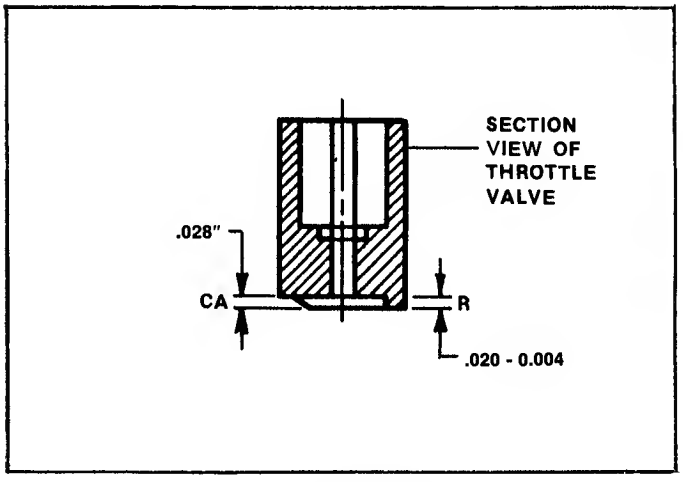


FIGURE 3.3

2. The supply rate of air-fuel mixture to the combustion chamber is controlled by changing the opening of the throttle valve. This action not only controls intake of air-fuel mixture into the engine but also meters the fuel flow rate from the needle jets. See Figure 3.4.

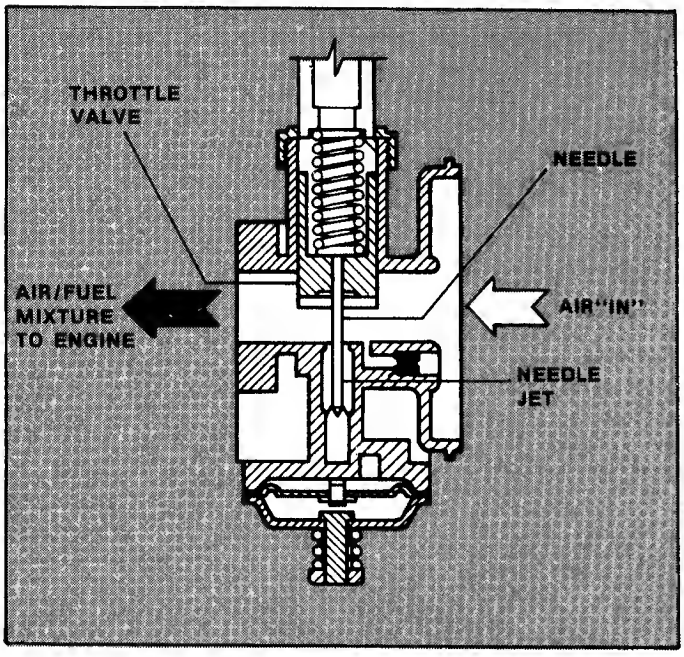


FIGURE 3.4

B. THROTTLE & NEEDLE JET ADJUSTMENT

1. Throttle Valve and Throttle Adjusting Screw engine idling, ajust engine to desired RPM's with the throttle adjusting screw (stop screw). See Figure 3.5.
   (a) Clockwise adjustment increases RPM's.
   (b) Counterclockwise adjustment decreases RPM's.

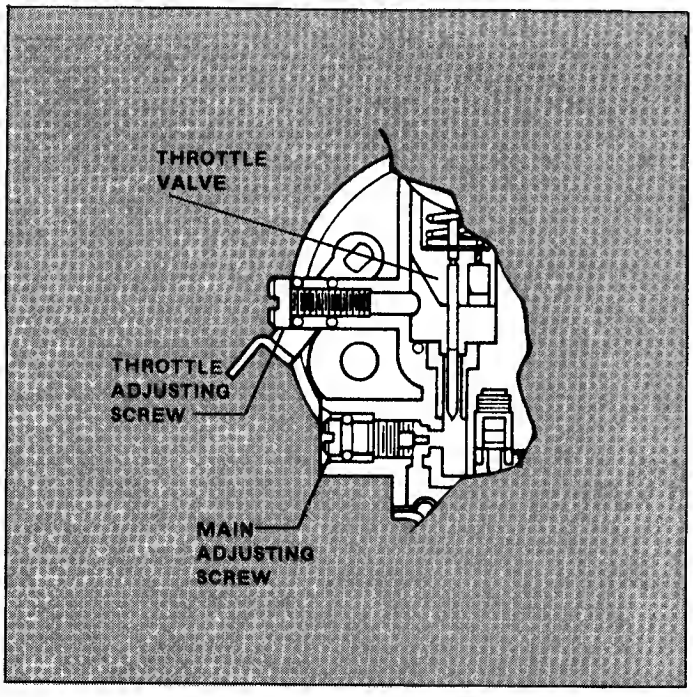


FIGURE 3.5

STANDARD IDLING RPM'S	2300-2700

2. **Jet Needle Adjustment**
   The head of the needlejet has three grooves in which a retaining clip is installed to control fuel flow from the needlejet body. The clip is usually in the second groove, readjustment is not usually required. See Figure 3.6.

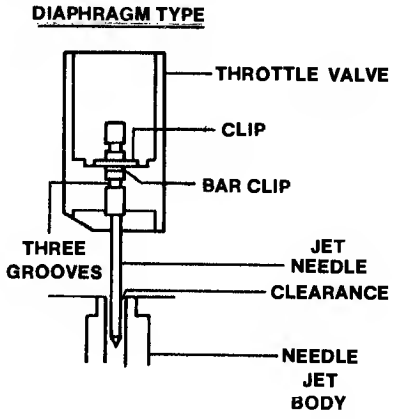


FIGURE 3.6

(a) When clips are set in upper grooves, the clearance between needle jet and body become less and the air-fuel mixture becomes lean.

(b) Installation of clips in lower grooves increases the clearance between needle jet and body and causes the air-fuel mixture to become rich.

D. MAIN DIAPHRAGM

Differential pressure between engine intake atmoshperic pressures is converted into vertical movement by the diaphragm. This operates the float valve and float arm and meters the incoming fuel flow to the carburetor. See Figure 3.7.

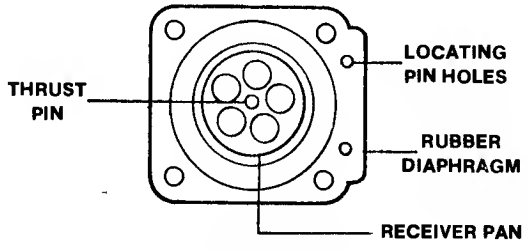


FIGURE 3.7

1. **Servicing Diaphragm**
   Periodically, the diaphragm should be visually inspected for damage and to see that the receiver pan is free of any deformation.
   (a) When reinstalling diaphragm to carburetor, make sure locating pins and holes are correctly aligned.
   (b) Use care when handling and installing diaphragm. Tighten screws in alternate cross-pattern to prevent deformation of receiver pan.

F.FLOAT VALVE

The float valve is operated by the vertical movement of the diaphragm and, when opened, allows fuel to flow into the chambers. See Figure 3.8.

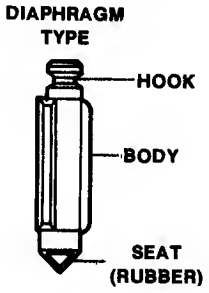


FIGURE 3.8

1. **Adjustment**
   It is imperative that the float valve operate smoothly at all times and that it maintain air-tightness when fully closed. If the valve seat becomes damaged by dirt, grit, etc. or shows signs of wear (stepping) after long periods of use, then it should be replaced.
2. **Repair**
   No attempt to repair a defective float valve should be made. If the valve loses its airtight intergrity, it should be replaced.

G.FLOAT VALVE REPLACEMENT

The following adjustment and assembly procedures should be adhered to when replacing the float valve in a diaphragm type carburetor.

1. **Adjustments**
   (a) Adjust the float arm height to within 0.5" - 0.6" of the body. See Figure 3.9.

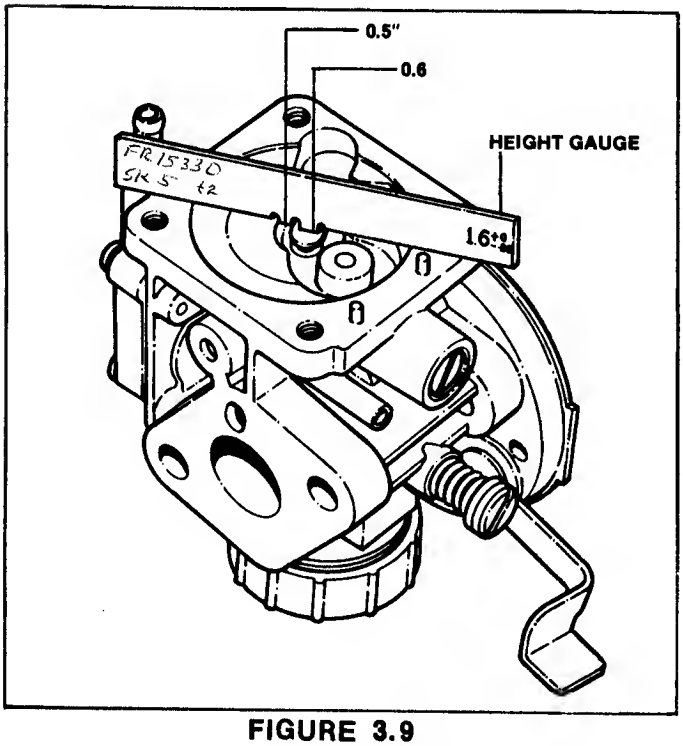


FIGURE 3.9

(b) Check to see that float and float valve operate smoothly after adjustment.
(c) Check free length of inlet valve spring. It should measure .31".
(d) Check pressure required to open valve. It should be 1.98±.4 lb/sq. in .

2. **Replacement**
   (a) Hook the float arm around end of new float valve.
   (b) Install inlet valve spring, checking to make sure that spring is correctly mated with float arm guide.
   (c) As float arm is being installed, insert float pin to point where it is completely under set screw. See Figure 3.10.

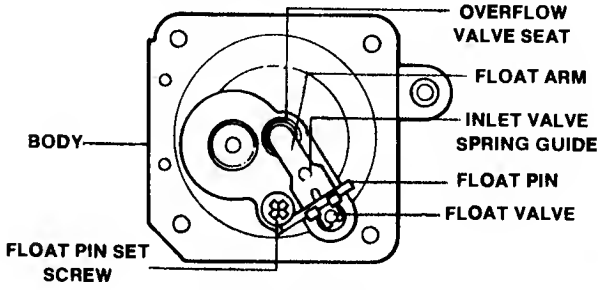


FIGURE 3.10

(d) Tighten set screw.

NOTE:
Care should be taken when installing float pin. If the float pin is not correctly seated and tightened, then the specified float lever height cannot be obtained and the valve opening pressure will be lost.

H.DIAPHRAGM CHECK VALVES

The diaphragm check valves work in conjunction with the diaphragm pump, float valve and throttle needle valve to supply proper air-fuel mixture to engine. See Figure 3.11.

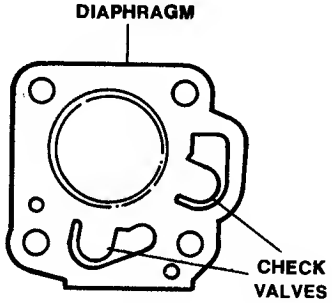


FIGURE 3.11

1. **Inspection**
   Inspect check valve membrane for flatness and damage. Replace if required.

SECTION III · CARBURETOR · CONSTRUCTION & SERVICE

I. MAIN ADJUSTING SCREW (Diaphragm Type)
The main adjusting screw controls fuel flow rate when engine is at high speed under heavy loading. See Figure 3.12.

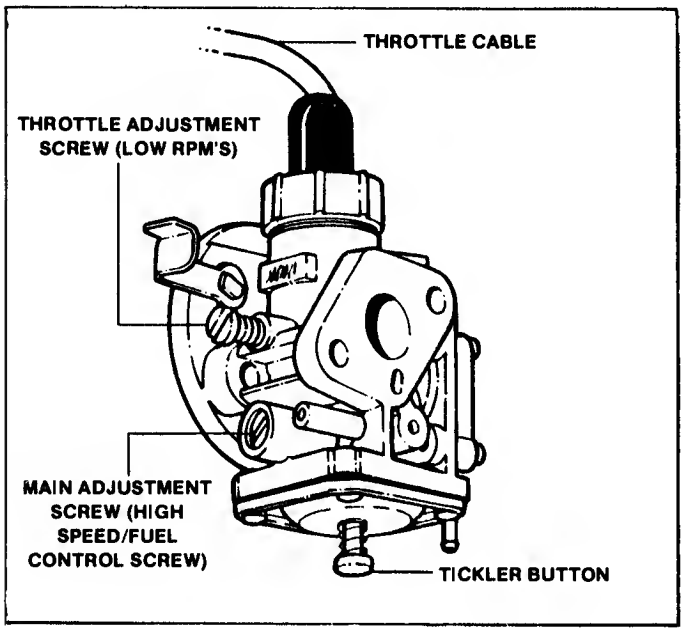


FIGURE 3.12

1. **Adjustment**
Adjust screw so that highest output is produced when a large load is applied at high speed.

(a) Move throttle to full open position

(b) By turning adjusting screw clockwise and counterclockwise two or three revolutions, set the main adjusting screw to where the engine revolutions are most stabilized.

(1.) Air-fuel mixture becomes lean when screw is turned clockwise.

(2.) Air-fuel mixture becomes rich when screw is turned counterclockwise.

(c.) Checking Acceleration/Deceleration

(1.) Quickly move throttle to open/close position. Check to see if acceleration/deceleration is made smoothly.

(2.) If engine stalls or if acceleration is not satisfactory, then air-fuel mixture is too lean. Adjust main adjusting screw until acceleration is correct.

J. THROTTLE WIRE REPLACEMENT
(Fully assembled engine)

A. DISASSEMBLY— See Figure 3.13.

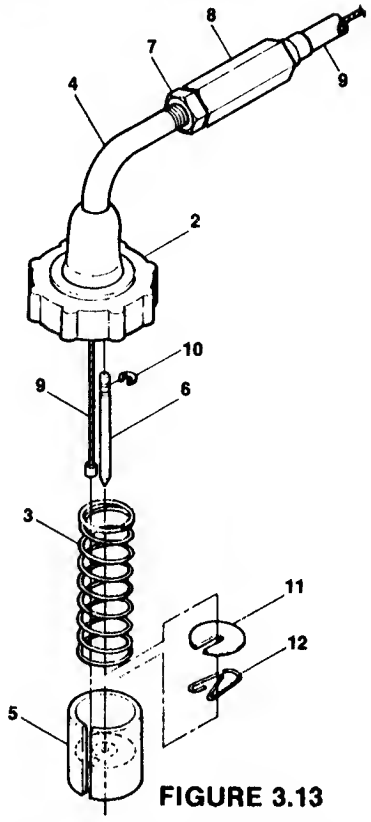


FIGURE 3.13

1. Remove mixing chamber cap (2) and pull out throttle wire (9), spring (3), throttle valve (5) and needle (6) as a unit.

2. Remove throttle wire (9) from throttle valve (5) by compressing mixing chamber cap (2) and throttle valve (5) together. As wire cap protrudes, remove it from bottom end of slotted hole.

3. Loosen lock nut (7) and unscrew throttle wire ferrule (8) from pipe elbow (4).

4. Remove throttle wire from elbow and cap assembly.

5. Replace throttle wire with new assembly.

B. REASSEMBLY
Reassemble in reverse order of above. NOTE: Make sure that spring plate (11) is on top of "C" clip (10) and centering spring (12). If assembled incorrectly, engine will not function properly.

SECTION III - CARBURETOR - CONSTRUCTION & SERVICE

3.3 CARBURETOR TROUBLESHOOTING

SYMPTOM		PROBABLE CAUSE	REMEDY
FAILURE TO START	Fuel not being fed into cylinder	Air leak around carburetor mount.	Tighten mounting screws
		Choke not fully closed.	Close choke
		Fuel passage plugged.	Disassemble & clean
		Main jet (float) plugged.	Disassemble & clean
		Main adjusting screw too tight.	Readjust
		Float arm adjustment is too low.	Readjust
		Faulty assembly of inlet valve spring.	Reassemble
		Incorrect installation of float arm pin.	Reassemble
	Excessive fuel feed	Fuel level too high.	Adjust float
		Dirt between float valve and seat.	Disassemble & clean
		Air filter dirty.	Disassemble & clean
		Main adjustment screw is at incorrect setting.	Readjust
		Float arm adjustment too high.	Readjust
		Needle jet clip set in too-low groove location.	Disassemble & reset clip
		Faulty assembly of inlet valve spring.	Reassemble
Idling is unstable		Rubber cap on carburetor loose or worn.	Fit securely or replace
		Float valve dirty.	Disassemble & clean
		Incorrect setting of throttle adjusting screw.	Readjust
		Float arm incorrectly adjusted.	Readjust
		Needle jet clip set in wrong groove.	Disassemble & reset clip
		Faulty assembly of inlet valve spring.	Resassemble
RPM's cannot be increased (engine stalls) or engine RPM's become unstable when they are increased		Choke partly closed.	Open choke
		Worn float valve.	Replace
		Main jet (float) plugged.	Disassemble & clean
		Main adjustment screw clogged.	Disassemble & clean
		Main adjusting screw is at incorrect setting.	Readjust
		Incorrect installation of float arm pin.	Reassemble
		Float arm incorrectly adjusted.	Readjust
		Faulty assembly of inlet valve spring.	Reassemble
		Deteriorated diaphragm.	Replace
		Slack throttle wire.	Adjust

SECTION III · CARBURETOR · CONSTRUCTION & SERVICE

3.3 CARBURETOR TROUBLESHOOTING

SYMPTOM	PROBABLE CAUSE	REMEDY
Engine stalls or skips under load conditions, but runs well for a short time when engine is restarted.	Filter in fuel tank is clogged (Diaphragm Type). Faulty ventilation of fuel tank cap. Pulse hole clogged (Diaphragm Type).	Clean Clean Clean
Air-fuel mixture too rich at high speed even with main adjusting screw all way in.	Worn main adjusting screw (Diaphragm Type).	Repalce parts
Faulty acceleration	Main adjusting screw has been overtightened (Diaphragm Type). Main jet plugged. Float arm incorrectly adjusted (Diaphragm Type). Loose diaphragm cover plate. Diaphragm leaking. Plugged needle jet. Idling **RPM**'s too low.	Replace Parts Clean Readjust Tighten Tighten or replace Clean Increase **RPM**'s
Carburetor over-flows.	Incorrect assembly/installation of float arm and valve spring. Worn float valve. Float valve operates incorrectly. Incorrect assembly of diaphragm. Float arm adjustment too high (Diaphragm Type).	Reassemble Replace Clean REassemble Readjust

SECTION IV - SEQUENCE OF ENGINE DISASSEMBLY

NOTE: Before disassembling engine, remove all fuel from tank.

4.1 AIR CLEANER

A. Remove Air Cleaner
(Parts removed with air cleaner)

1. Filter Element
2. Baffle plate
3. Wire mesh
4. Air cleaner cover

4.1 FUEL TANK

A. Disconnect fuel line from carburetor.
B. Loosen fuel tank retaining strap.
C. Remove Fuel tank.
D. Remove rubber shock pads by sliding towards center of crankcase.

4.3 CARBURETOR

A. Remove overflow pipe from retaining clip (leave pipe attached to carburetor).

B. Using Phillips screwdriver, remove the two carburetor mounting screws.

C. Remove carburetor (**NOTE:** It may be necessary to lightly tap sides of carburetor to loossen it from gasket). **CAUTION:** If throttle control is attached to carburetor at this point, then remove throttle lever control assembly from shaft handle and remove carburetor & THROTTLE CONTROL ASSEMBLY AS A UNIT.

D. Loosen two retaining screws and then remove carburetor insulator mount. (Note that the insulator mount and its gaskets have a pressure relief hole which faces towards the crankcase - this is vital during reassembly).

E. Remove mounting screws and carburetor mount.

See Section III for carburetor disassembly.

4.4 MUFFLER

A. Remove three screws and washers and muffler guard.
B. Using 5/16" socket or wrench, remove two muffler retaining nuts.
C. Remove muffler gasket.
D. Remove muffler gasket shield. (**NOTE:** THAT LEG IS INSTALLED TOWARDS ENGINE).

4.5 CYLINDER COVER

A. Remove spark plug wire from plug.
B. Remove cylinder guard.

4.6 FAN CASE

A. Remove ignition wires from retaining clamp. Remove clamp.
B. Remove flywheel housing (Parts removed with flywheel housing).
1. Fuel tank retaining strap.
2. Ignition coil.

4.7 CENTRIFUGAL CLUTCH

A. Remove centrifugal clutch from flywheel. (Fit screwdriver between clutch mounting boss and flywheel protrusion to prevent flywheel from turning. See Figure 4.1)

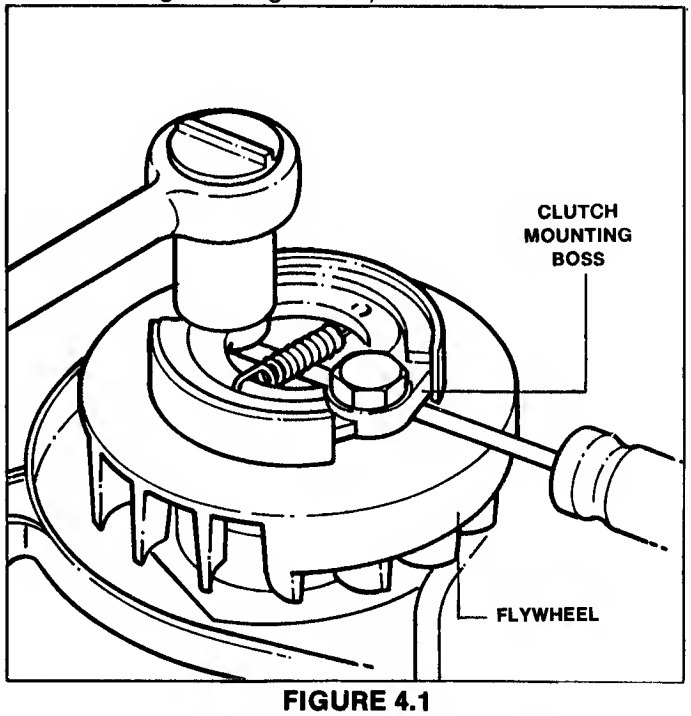


FIGURE 4.1

B. If clutch is disassembled, make sure that marked sides of shoes (P,M) are matched during reassembly.

4.8 RECOIL STARTER

A. Remove recoil starter assembly.
(Parts removed with recoil starter)
1. Fuel tank strap.
2. Over flow pipe clamp.

B. Remove 3 - pronged starter pulley. (Fit screwdriver between pawls of pulley to prevent turning. See Figure 4.2). Turn pulley counter clockwise.

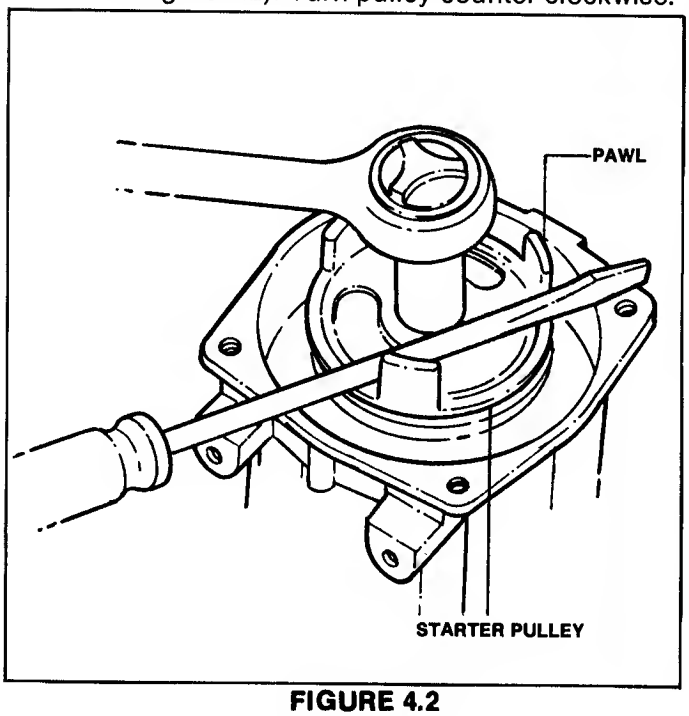


FIGURE 4.2

4.9 POINTS

A. Remove points and condenser.

B. Remove **MTI** unit (electronic ignition).

4.10 FLYWHEEL

A. Remove flywheel retaining nut by inserting a 7.5mm (.29") dia. pin into cast hole in flywheel and fitting a screwdriver between pin and clutch mounting boss to prevent flywheel from turning. See Figure 4.3.

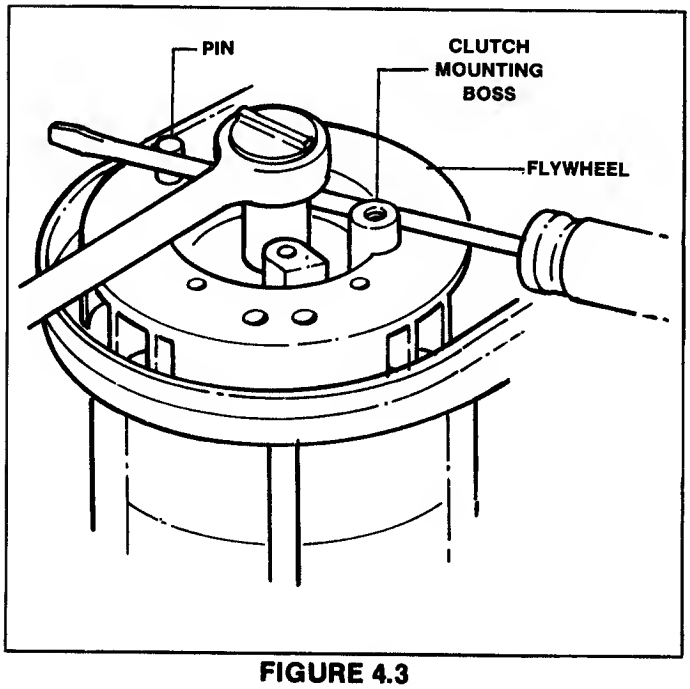


FIGURE 4.3

B. Use flywheel puller to remove flywheel. See Figure 4.4.

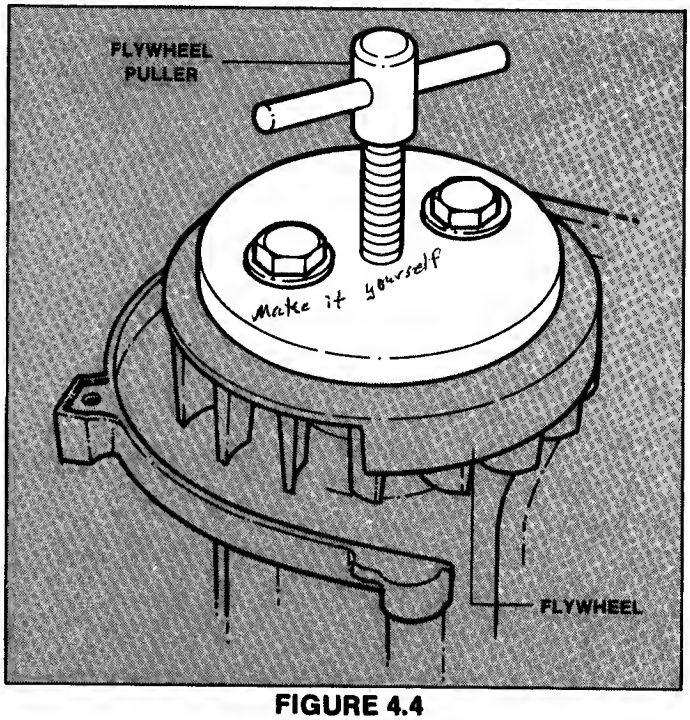


FIGURE 4.4

4.11 SPARK PLUG

A. Remove spark plug.

4.12 CYLINDER

A. Remove cylinder.

4.13 CRANKCASE

A. Split crankcase by removing four (4) screws and washers.

B. Separate crankcase.

4.14 PISTON

A. Remove piston pin snap rings.
B. Remove piston pin and piston.
C. Remove piston rings.

4.14 INSPECTION AFTER DISASSEMBLY

A. Cylinder
Remove all carbon deposits using a flat head screwdriver. CAUTION: Be careful not to scar cylinder walls or any machined surface.

B. Piston
Remove all carbon deposits from piston surface and ring grooves. If piston is badly pitted or scarred, replace. See Figure 4.5.

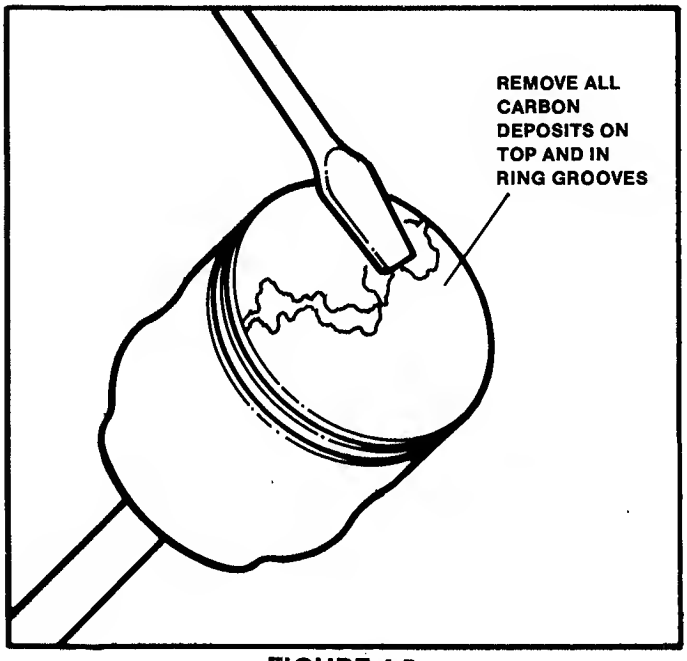


FIGURE 4.5

C. Routine Inspection
Check the normal performance of all sliding and rotating surfaces piston, piston rings, cylinder, crankshaft, bearings, oil seals, etc.

D. Muffler
Remove excessive carbon within muffler using heavy gauge wire or screwdriver. If this method doesn't work remove gasket and burn out the carbon with a torch. See Figure 4.6.

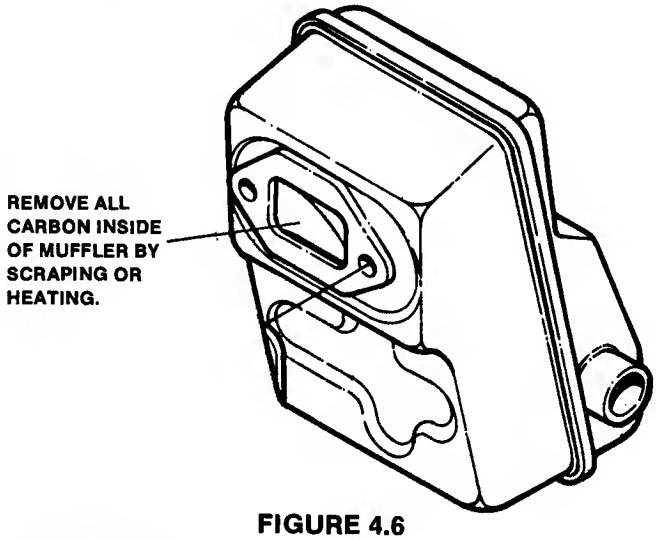


FIGURE 4.6

E. Spark Plug
Clean spark plug with glass bead blaster or some other means of carbon removal. After cleaning electrode and insulator re-gap spark plug to 0.6-0.7 mm. See Figure 4.7.

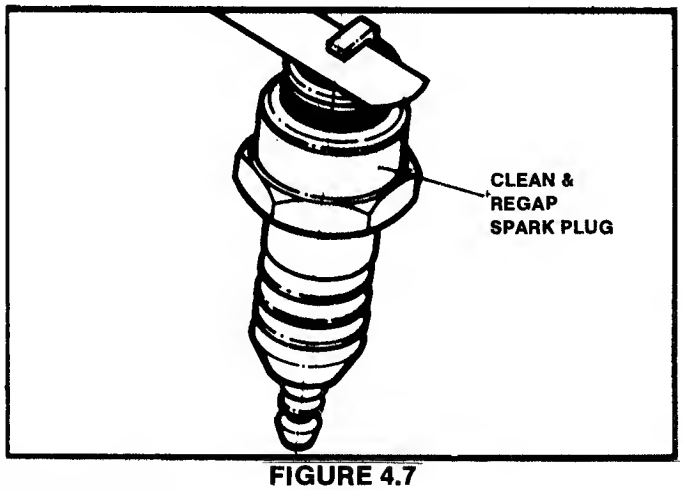


FIGURE 4.7

Troubleshooting Chart

SYMPTOM	PISTON	PISTON RINGS	CRANKSHAFT ASSEMBLY	CYLINDER	OIL SEAL	BEARING
Low Compression	•Abrasion •Seize •Scratch	•Abrasion •Carbon build-up		•Carbon build-up •Pulse hole clogged	•Cracked or chipped •Not seated	
Internal Engine Noise	•Wrist Pin Worn	•Broken Ring(s)	•Abrasion of pin and both ends of Rod			Worn out bearing(s)

Section V - RECOIL STARTER REPAIR

5.1 DISASSEMBLY

A. Remove binding screw.

B. Remove friction plate (2), friction spring (3) and ratchet (4) as a unit.

C. Remove return spring (5). See Figure 5.1

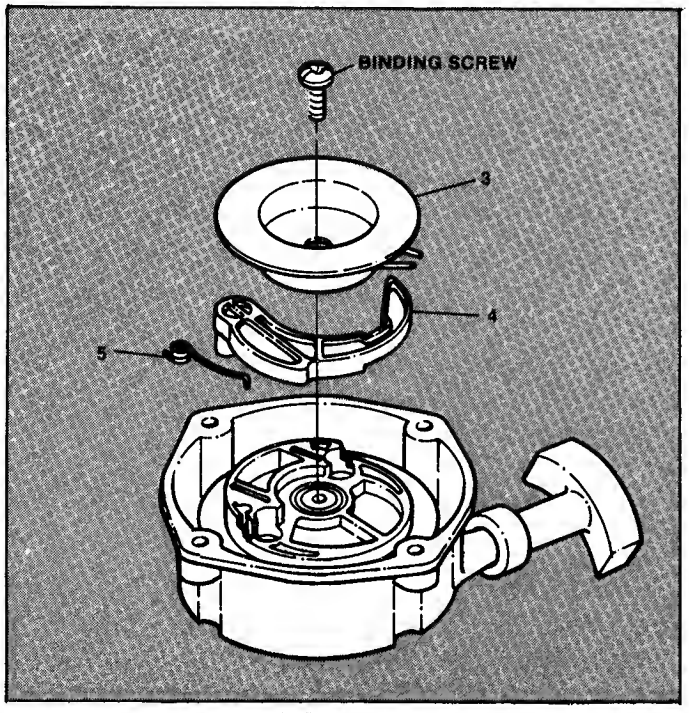


FIGURE 5.1

5.2 STARTER ROPE REMOVAL/INSTALLATION

A. Pull the starter rope out about 12" until the notch in the reel lines up with the starter rope outlet. Hold the reel securely to prevent its turning, and pull starter rope out from inside of case. See Figure 5.2.

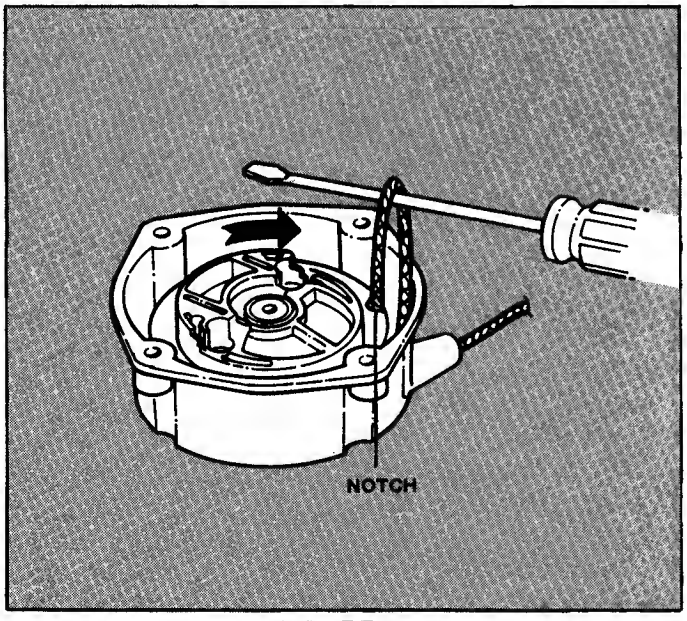


FIGURE 5.2

B. Continue holding the pulley and unwind the rope in the direction of the arrow shown in Figure 5.2.

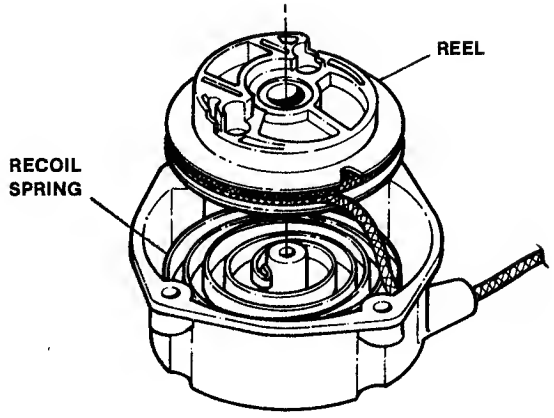


FIGURE 5.3

C. After the starter rope is completely unwound, the reel should lift free from the recoil spring. See Figure 5.3.

NOTE: Remove the reel carefully to avoid causing spring to jump out of position.

D. Remove old rope from starter handle and reel.

E. Use a 1/8" diameter x 33" long braided nylon rope as replacement starter rope.

5.2 REASSEMBLY

A. If spring requires replacement, mount new spring in recoil starter case.

NOTE: If existing spring jumped out of position during disassembly, it can be rewound by forming a wire of slightly smaller diameter, than starter case spring seat and rewinding spring inside. See Figure 5.4.

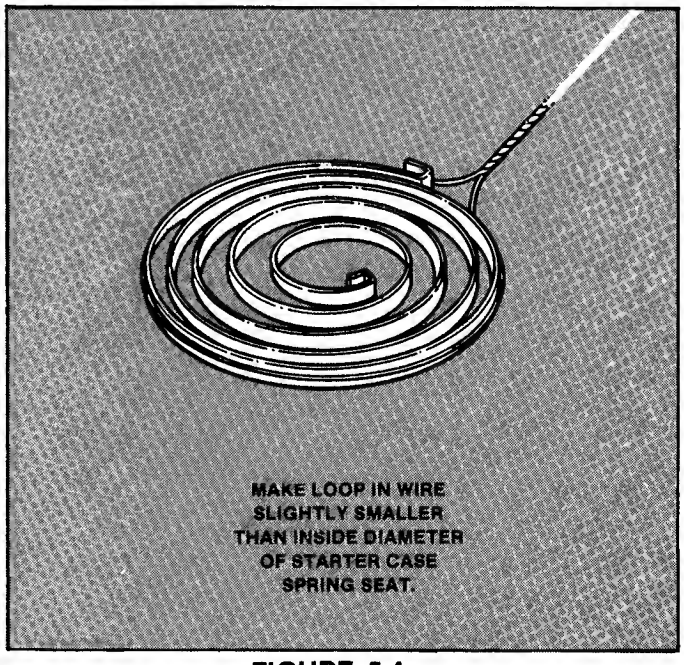


FIGURE 5.4

B. Adjust spring inside starter housing until inner end of spring is positioned about 1/8 inch from shaft as shown in Figure 5.5 (This positions the spring end for easy engagement with reel hook).

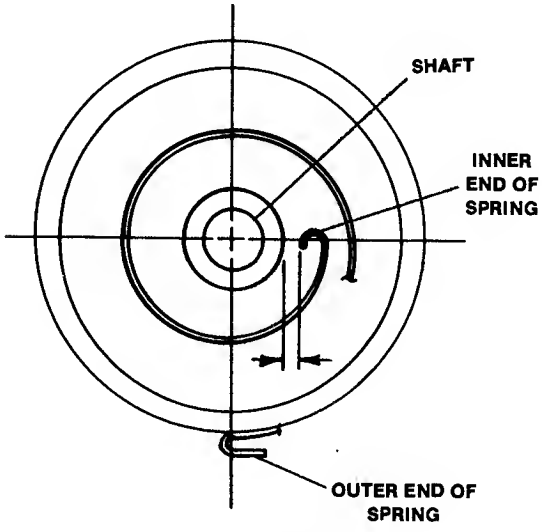


FIGURE 5.5

C. Apply a small amount of GP grease to underside wear surface of reel.

D. Wind starter rope on reel in direction of arrow shown in Figure 5.6. After 3½ rounds, bring the rope out at the reel notch.

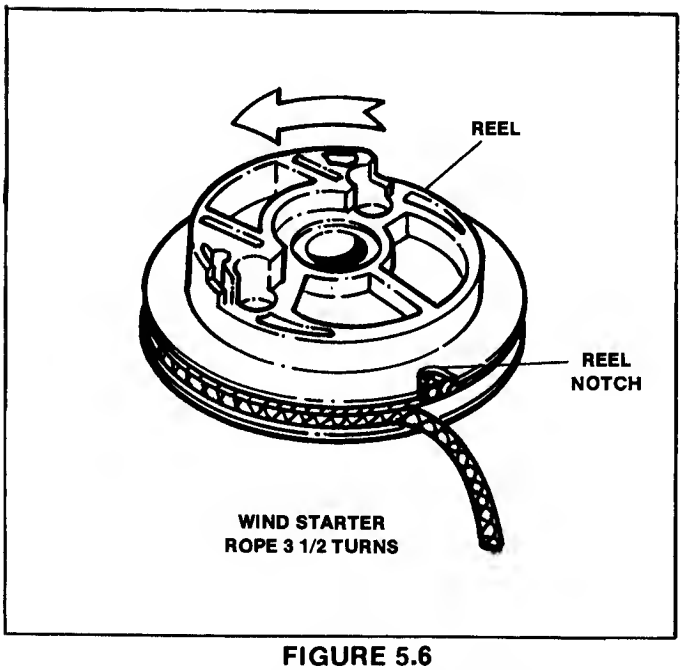


FIGURE 5.6

E. Mount reel onto spring. Make sure there is positive engagement between reel and spring hook.

F. Holding reel, wind starter rope an additional three turns on reel. Pull slack out recoil port. See Figure 5.7.

NOTE: Allow reel to recoil starter rope slowly. Otherwise reel assembly and spring may jump out of starter case.

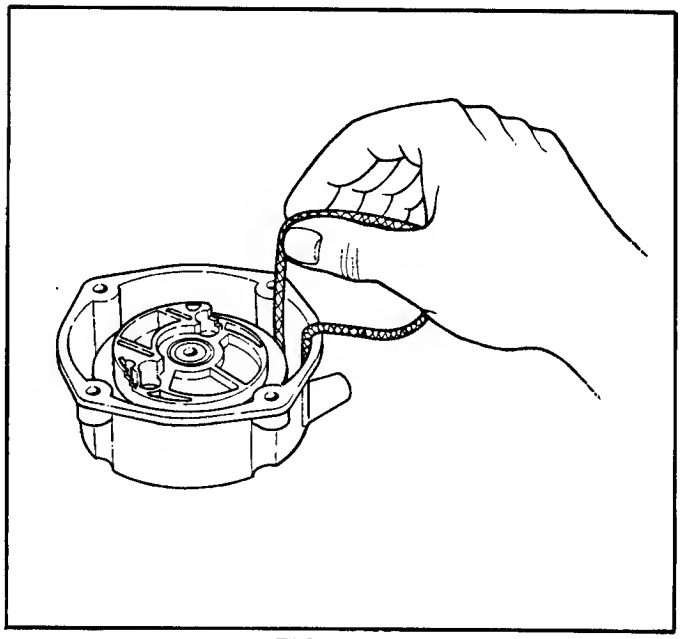
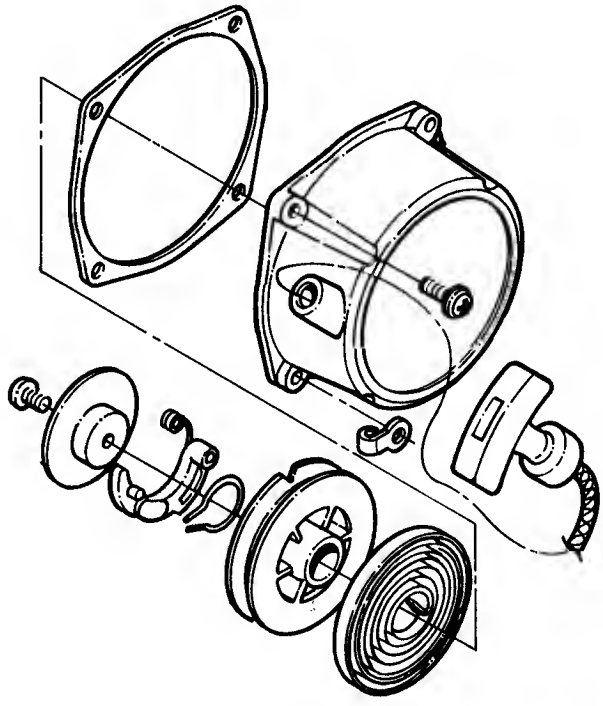


FIGURE 5.7

G. Install return spring.

H. Install ratchet, friction spring and friction plate.

I. Apply thread locking compound to binding screw and tighten in place.



EXPLODED VIEW OF RECOIL STARTER ASSEMBLY

Section VI - SEQUENCE OF REASSEMBLY

6.1 PISTON

A. Mount piston rings in ring grooves with open ends fitted to drive pins. (Top side of piston rings are marked "T").

B. Assemble piston to connecting rod, making sure hole in piston crown is facing intake side of engine.

C. Insert snap rings securely on each side of wrist pin.

6.2 CRANKCASE

A. Fit starter side of crankcase to crankshaft.
- (1) Apply oil to mounting pins on crankcase.
- (2) Insure that mating surfaces of crankcase are clean. Apply gasket cement to gasket and mating surfaces of crankcase.
- (3) Apply GP grease to oil seal lip.

B. Combine crankcase halves and tighten screws. Wipe away any excess gasket cement.

C. Check axial play of crankcase.

CRANKSHAFT AXIAL PLAY CHART	
Standard Dimension	.0008" - .001"
Allowable Limit	.002"

Adjustment shims for eliminating excessive axail play are:
.0004" .002" .004" .008"

6.3 CYLINDER

A. Coat piston with a light coat of oil and check to see that piston ring ends are correctly located at drive pin position.

B. Install gasket in correct position on crankcase.

C. Using ring compression band, mount cylinder to piston. DO NOT ROTATE CYLINDER WHEN MOUNTING ONTO PISTON! If cylinder is rotated during installation, open ends of piston rings may catch in cylinder parts and be broken.

D. Tighten cylinder screws securely.

6.4 FLYWHEEL

A. Clean keyed and tapered bore section of flywheel. DO NOT USE STEEL WOOL!

B. Fit key onto crankshaft.

C. Mount flywheel to crankshaft and tap into place (if required) with rubber mallet. Check to make sure key is properly seated in keyway.

D. Insert a .29" diameter bar into hole cast in flywheel. Place a screwdriver between bar and clutch mounting boss to prevent flywheel from turning.

E. Install spring washer, flat washer and nut to threaded end of crankshaft. Tighten securely.

6.5 CENTRIFUGAL CLUTCH

A. Determine which clutch shoe mounting surface ([illegible] or M) is to face outward.

B. Install a flat washer between each shoe and mounting boss.

C. Apply thread locking compound to each clutch bolt. Install and hand tighten.

D. Place screwdriver between clutch mounting bosses to prevent flywheel from turning while tightening clutch bolts.

E. Torque bolts to required specifications.

6.6 IGNITION COIL

A. Mount ignition coil loosely inside flywheel housing. Screws should be finger tight.

B. Insert spark plug wire dust seal into slot in flywheel housing.

NOTE: Spark plug outlet from coil and ground wire should face outwards from the engine.

C. Place a brass shim or strip of paper of correct tolerance (.016" - /.020" - 0.5 mm) across magnetic section of flywheel.

D. Install flywheel housing (with ignition coil installed) to crankcase. Insert holding screws finger tight.

E. Working from behind flywheel housing, adjust coil to shim thickness. Tighten ignition coil retaining screws.

F. Remove housing and remove shim.

G. Install housing and torque screws to required specifications.

NOTE: Install wire lead clamp and fuel tank band to crankcase when installing flywheel housing.

6.7 CLUTCH ASSEMBLY

A. If applicable mount clutch drum assembly inside clutch housing.

B. Attach clutch housing to drive side of engine.

6.8 BREAKER POINTS

A. Mount breaker points and condenser.

B. Adjust ignition timing.
- (1) Adjust to where points begin to open as match mark on flywheel lines up with designated mark (M or P) on crankcase.
- (2) Ignition timing: $25° \begin{smallmatrix} +4° \\ -2° \end{smallmatrix}$ BTDC.

C. Adjust point gap to .011/.015 when point leg is located on high point of cam. See Figure 6.1.

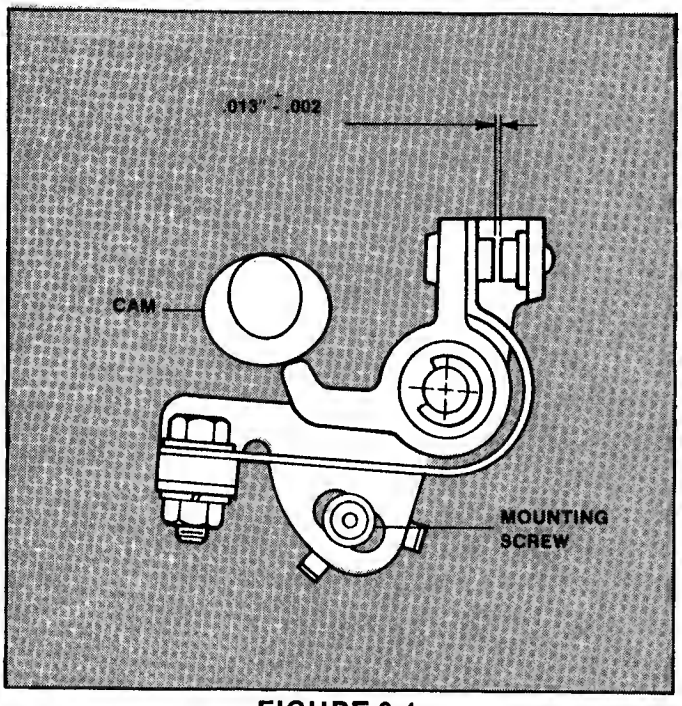


FIGURE 6.1

(1) Check position and offset of both points. See Figure 6.2.

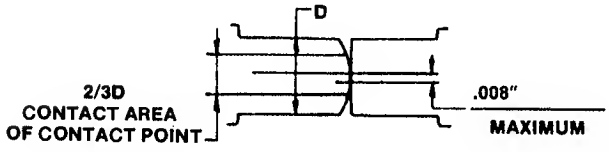


FIGURE 6.2

(2) OFFSET: .008" Max. in all directions.
POSITION: 2/3 Max. at center of diameter.

D. Add drop of oil to felt lubricator.

6.9 MTI UNIT

If not fitted with points, then mount MTI unit.

6.10 RECOIL STARTER

A. With flat washer underneath, screw recoil starter pulley onto crankshaft.
(1) Lightly tap pawls of pulley with rubber mallet to tighten pulley.
(2) Indert screwdriver through crankcase air inlet into fan area. Place against crankshaft housing and fan casting (not against cooling fin) to keep engine from turning.
(3) Tighten pulley retaining nut to torque specifications.

B. Mount recoil starter assembly.
(1) **NOTE:** Parts to be mounted with the recoil starter assembly are:
(a) Fuel tank hanger band
(b) Two rubber pads
(c) Overflow pipe bracket
(2) Do not tighten the mounting screw that will be used to retain the muffer guard.

6.11 CYLINDER GUARD

A. Mount cylinder guard.
B. Insure that spark plug wire dust seal is properly mounted.
NOTE: Cylinder guard should be only loosely attached as its fasteners are also used for mounting muffler guard.

6.12 SPARK PLUG CJ8, NGK BM-6A, 6802.5

A. Check spark gap for correct setting and install spark plug.
B. Press on spark plug wire and twist to the right to seat connector.

6.13 FUEL TANK

A. Mount rubber pads to crankcase.
B. Mount fuel tank and tighten hanger strap.
C. Tighten hanger strap lock nut.

6.14 MUFFLER

A. Mount muffler gasket with angled part towards cylinder.
B. Mount muffler.
C. Mount muffler cover.
D. Mount muffler guard

6.15 CARBURETOR

See Section III - CARBURETOR-CONSTRUCTION & SERVICE for maintenance instructions.
A. Mount carburetor gasket and metal mounting flange at one time. Insure that pulse hole in gasket is aligned with hole in cylinder.
B. Mount carburetor (plastic) mounting flange and gasket to metal mounting flange. Tighten screws alternately to prevent breakage of part. Insure that pulse hole is in alignment with metal flange.
C. Mount carburetor.
D. Attach fuel line.

6.16 AIR FILTER

A. If required, disassemble, check and clean air filter. Reassemble.
B. Mount air filter.

Section VII - TORQUE SPECIFICATIONS CHART

ITEM	FASTENER TYPE	TORQUE SPEC.
Crankcase	Panhead screw	0.9 - 1.1 lbs. inch
Cylinder	Socket head cap screw	0.9 - 1.1 lbs. inch
Flywheel housing	Pan head screw	0.9 - 1.1 lbs. inch
Flywheel	Nut	2.2 - 2.9 lbs. inch
Starter pulley	Nut	2.2 - 2.9 lbs. inch
Insulator (Carburetor)	Pan head screw	0.7 - 1.0 lbs. inch
Carburetor	Pan head screw	0.7 - 1.0 lbs. inch
Air filter	Pan head screw	0.3 - 0.4 lbs. inch
Muffler	Nut	1.3 - 1.5 lbs. inch
Recoil starter	Pan head screw	0.9 - 1.1 lbs. inch
Fuel tank	Pan head screw	0.4 - 0.7 lbs. inch
Spark plug		2.6 lbs. inch
Breaker points	Pan head screw	0.4 - 0.7 lbs. inch
Ignition coil	Bolt	0.9 - 1.1 lbs. inch
Centrifugal clutch	Shoulder bolt	1.8 - 2.2 lbs. inch
MTI unit	Pan head screw	0.4 - 0.7 lbs. inch
Miscellaneous	Pan head screw	0.4 - 0.9 lbs. inch

SECTION VIII - ENGINE TROUBLESHOOTING CHART

	SYMPTOM	PROBABLE CAUSE	REMEDY
ENGINE HARD TO START	Fuel System	Fuel level.	If low add fuel.
		Fuel filter.	Clean or replace.
		Fuel mixture.	Using ratio of 32:1 fresh fuel.
		Air in fuel line.	Prime while depressing tickler button.
	WEAK COMPRESSION	Fuel leak from oil seal.	Remove and replace.
		Fuel leak around spark plug.	Tighten spark plug.
		Fuel leak between block and cylinder.	Replace gasket and torque according to Section VII.
		Piston rings excessively worn.	Replace (Refer to Section II pages 10-11).
		Fuel mixture.	Using ratio of 32:1 fresh fuel.
	Weak or No Fire	Kill switch off	Turn on.
		Spark plug fouled	Clean or replace.
		Ignition Coil	Set air gap. (Section 11, page 14).
			Check with coil tester, replace if necessary.
		Breaker points fouled	Clean or replace.
		Condensor bad.	Replace.
		Primary or secondary wires bad.	Replace.
		MTI unit bad	Replace.
		Point gap.	Reset point gap (Section 11, page 15-16).
	Spark Plug Wet	Choke on.	Turn off.
		Fuel mixture.	Using ratio of 32:1 fresh fuel.
		Excessive fuel suction (Tickler is not fully engaged).	Remove spark plug, pull starter rope to clean excessive fuel.
TROUBLE DURING OPERATION	Insufficient Power or Operation Occasionally Interrupted	Ingition out of time.	Adjust timing. (Section II, page 16).
		Spark plug fouled.	Clean or Replace, regap.
		Excess carbon build-up in exhaust port.	Remove muffler. Clean out carbon build-up in port.
	Backfiring	Ignition out of time.	Adjust timing. (Section II, page 16).
		Excessive carbon build-up in exhaust port and/or muffler.	Remove muffler, clean or replace. Clean carbon build-up from exhaust port.

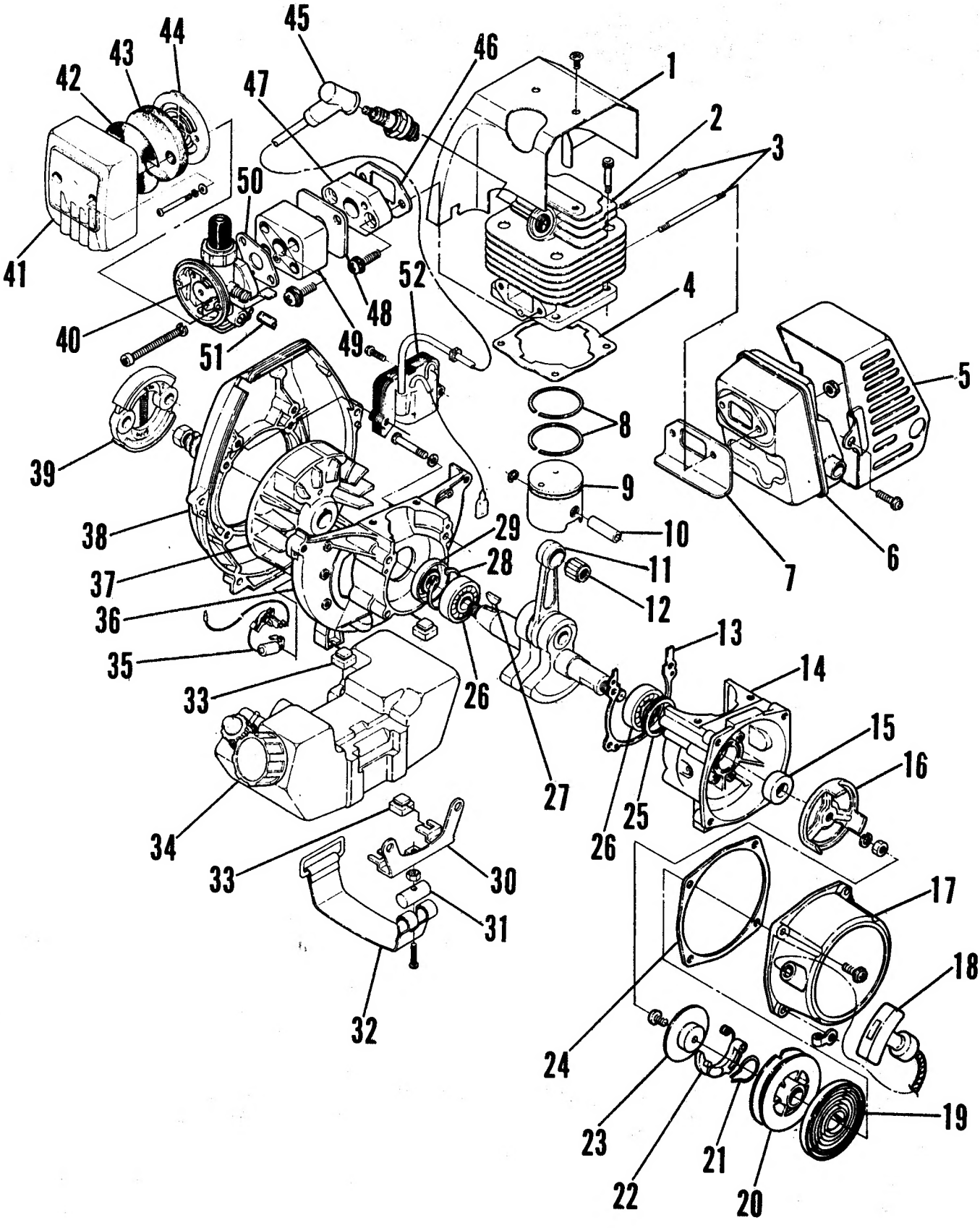
SECTION VIII - ENGINE TROUBLESHOOTING CHART

	SYMPTOM	PROBABLE CAUSE	REMEDY
ENGINE STALLS DURING OPERATION	Suddenly Stalls	Out of fuel	Using ratio of 32:1 refill fuel tank.
		Fuel filter stopped up.	Clean or replace.
		Fuel line stopped up.	Clean or replace.
		Diaphragm worn or damaged.	Remove and replace.
	Inadequate Firing	Ingition out of time.	Adjust timing (Section II, page 16).
		Primary and/or secondary wires damaged.	Replace.
	Knocking Within Engine	Worn or damaged parts.	Replace. See Section II.

SECTION IX - PARTS

ITEM NO.	DESCRIPTION
1	Cylinder Cover
2	Cylinder
3	Muffler Mounting Studs
4	Cylinder Gasket
5	Muffler Guard
6	Muffler
7	Muffler Gasket
8	Piston Rings
9	Piston
10	Wrist Pin
11	Connecting Rod/Crankshaft Assembly
12	Needle Bearing
13	Crankcase Gasket
14	Crankcase (Starter Side)
15	Oil Seal
16	Recoil Starter Pulley
17	Recoil Starter Housing
18	Recoil Starter Handle/Rope Assembly
19	Spiral Spring
20	Reel
21	Friction Spring
22	Ratchet
23	Friction Plate
24	Recoil Starter Gasket
25	Shim (Set of 3)
26	Bearing

ITEM NO.	DESCRIPTION
27	Woodruff Key
28	Snap Ring
29	Oil Seal
30	Tank Hanger
31	Band Support Bar
32	Tank Band
33	Tank Pad
34	Fuel Tank
35	Point and Condenser Assembly
36	Crankcase (Drive Side)
37	Flywheel
38	Flywheel Housing
39	Centrifugal Clutch
40	Carburetor
41	Air Cleaner Cover
42	Wire Mesh
43	Foam Element
44	Baffle
45	Spark Plug Boot
46	Gasket (A)
47	Intake Flange (A)
48	Gasket (B)
49	Intake Flange (B)
50	Carburetor Gasket
51	Overflow Tube
52	Ignition Coil Assembly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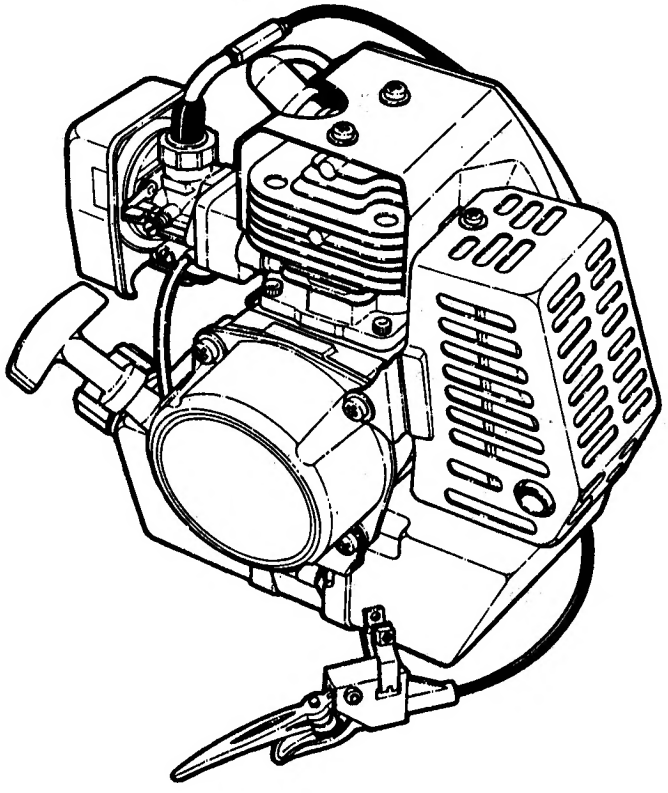

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